

University of Cape Town

Healing Waters

Creating Therapeutic Space

Design Research Project APG5058S

Submitted in partial fulfilment of the requirements for the degree
Master of Architecture (Professional)

by

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GLOSSARY OF TERMS

Aquatic therapy	This term refers specifically to the rehabilitation of patients with disabilities, physical injuries or social disorders by means of scientifically calculated exercises in water directed by a qualified or trained occupational therapist.
Capillary action	The ability of a liquid to flow against gravity, spontaneously rising up in a narrow space such as a thin tube or inside the microscopic voids of porous materials and plants.
Coagulate	To change from a liquid to a thickened or semi-solid state so that it looks like curdled milk.
Constructed wetland	An artificial structure that is designed to mimic a natural wetland or swamp by using aquatic plants planted in shallow lined basins to absorb excess nutrients from waste water.
Effluent	Liquid waste (used water) or sewage discharged into a river or the sea.
Flocculation	A condition in which clays, polymers or other small particles dissolved in water cling to each other to form a fragile structure called a floc that resembles a lumpy or fluffy mass.
Hydrotherapy	Any form of therapy that uses water as a medium. In this study it is the collective term for both the treatment of physical injuries/ailments and the treatment of psychiatric disorders by means of water.
Sand filter	A slow gravity-fed system that is used to 'strain' polluted water through layers of sand varying in coarseness in order to remove organic compounds in the water.
Sedimentation	This is a physical water treatment process used to settle out suspended solids in water under the influence of gravity.
Thermotherapy	This form of hydrotherapy makes use of water's extraordinary ability to safely and quickly conduct extreme temperatures.
TRUP	The Two Rivers Urban Park of which the proposed site for this project forms a part of.

INTRODUCTION

My desire to investigate the themes of architectural psychology and that of water as an architectural element originated from two areas. Firstly, in my studies I have always been fascinated by how and why people react to space and objects around them. Can architecture manipulate people's emotions? If the answer is yes, as I believe it is; is it possible then that architecture can contribute positively to a person's well-being? Is there such a thing as healing architecture? Or is it just a naïve fabrication of the architect's imagination to add existential value to his work; a hope for a better world - Utopia?

Secondly, during the summer of 2010, I spend my holidays back home with my parents in Beaufort-West. At this point in time the whole district of the central Karoo, amongst other areas of the country, had been experiencing an extensive drought for almost four years. The water crisis was so bad that alternative solutions for the town's drinking water supply were put in place. Though water restrictions, water sharing and even water donations from other towns offered some relief, these measures were not sufficient to eradicate the problem. After thorough investigations and research, the municipality finally announced the instalment of a water reclamation plant. Towards the end of December the recycled sewage water system came into operation. At present the town's people are able to drink clean recycled water. This situation reminded me of the importance of water in our society. Not only is there a drastic need for us to preserve our natural resources but the timeless topic of water has also been explored in architecture in almost all cultures globally throughout history. Water used in architecture is a richly charged, invigorating concept physically and psychologically.

My research on these two topics (water and architectural psychology) has led me to a not-so-surprising merging of the two as I discovered that 'water' and 'psychology' in architecture are often intertwined. Therefore this thesis dissertation explores the concepts, methods and theories of the psychology of space created by the means of water as a key element in the architecture. The proposal places water as the central material with which therapeutic methods can be constructed to stimulate the user's perceptions through his/her main sensory receptors. The aim is to understand how water in architecture can ultimately affect both psychological and physiological development on a human and urban scale.

This theme of 'healing' will be investigated further in the location of the design project. The proposal is an intervention situated near the confluence area of the Liesbeek and Black Rivers in Cape Town that takes on the form of a place of healing. The structure itself will play an active role in healing its own environment by providing a filter or water purification system for the polluted Black River so that water can be used for different therapeutic, agricultural and recreational purposes in the intervention.

This document is a compilation of research, sketch proposals and design philosophies that illustrate the design process from beginning to end, which stretched over a period of just less than ten months. At the start of this thesis project, a two-part academic research investigation was conducted that formed the theoretical basis for the design. The first paper was a theoretical investigation that explored the psychological effects on mind and body of human engagement with water. The second paper was a technical investigation exploring tectonic methods and structures that might have been employed in the design project. Included in this document is a summary of these two investigations under the section of *Supporting Enquires*. These two theory reports, as well as this design report and the final design proposal, together make up the complete thesis dissertation.

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ARCHITECTURAL PROPOSITION

This design investigation seeks to raise the concern that too often architects create buildings and structures without putting real thought into the effect of their design decisions on the people who inhabit the spaces. More often than not we do not realise the immense influence built structures have on human society as we dwell in them on a daily basis. Even the seemingly 'homeless' person finds his shelter in the shadow of buildings and the in-between spaces of the city. As is true to our nature, we as humans seek to create a meaningful dwelling for ourselves all the time. It is fair to say then that the spaces we produce can influence the wellbeing of the person who dwells in them. If that is true, then architecture can be but one small, yet effective tool to utilize in order to better our living conditions and our emotional wellbeing. Therefore the notion that form and space and the arrangement of the two can and should be carefully considered by the architect is the driving force of this investigation.

Another concern is the rise of global environmental problems and the decrease of our natural resources caused by our actions (and sometimes inaction) in the past. We have reached the point where the careful employment of resources in the built environment is not only a nice-to-have, but an absolute necessity in design. In the introduction I have given a brief background of my interest in water and its role on our planet. Today we have far more harmful pollutants entering our water bodies from industrial factories and badly managed sewage treatment systems than ever before. The global freshwater crisis is a reality that stares us all in the face. But I see this as a great opportunity for architects and other designers to not only positively affect the natural environment but to also use the challenges we face to open up new ground-breaking design possibilities.

My response to these concerns takes on the form of an architectural proposition that suggests representing the concept of healing in four different spheres, namely: psychological, physiological, sociological, and environmental. In more qualitative terms, this building would seek to contribute to the healing of the mind, the body, society, and the natural environment. These notions may seem ambitious or idealistic, but are nonetheless a worthy investigation when we seek to produce an architecture that is all the more enriched and meaningful.

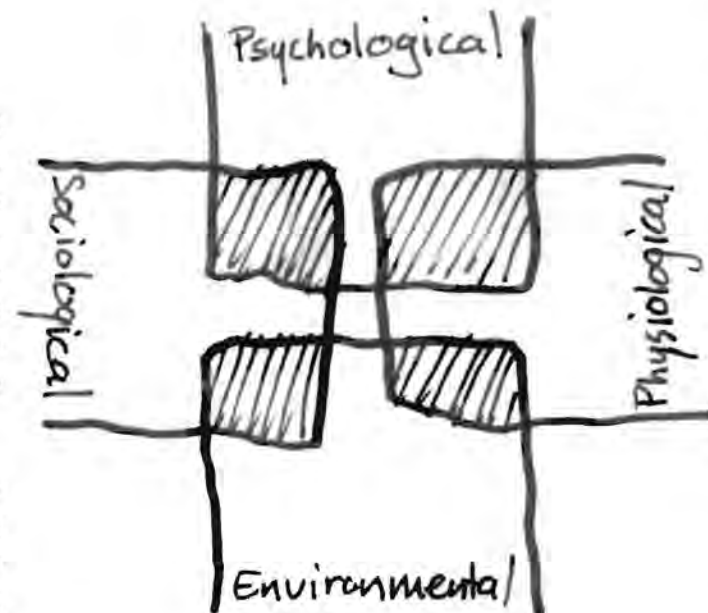
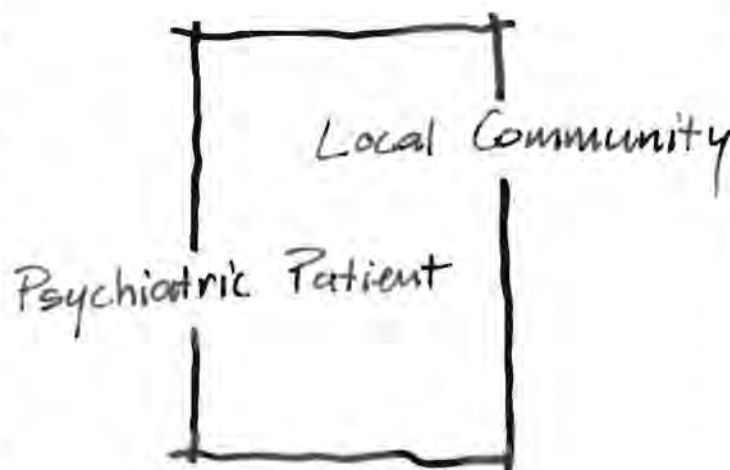
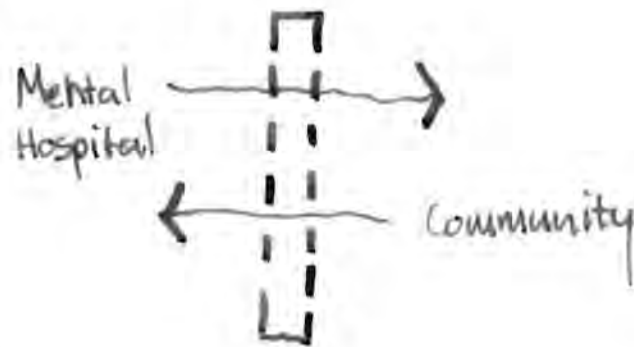
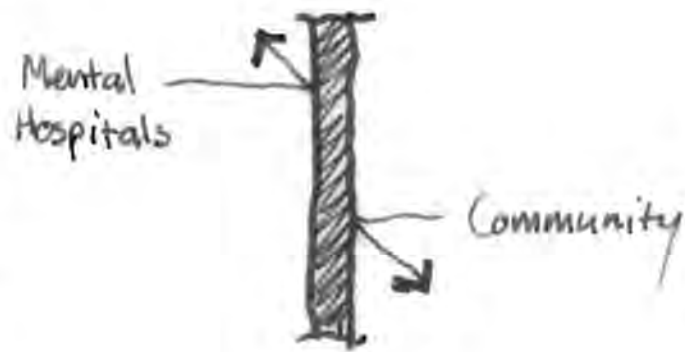


Figure 1 (Top): The four spheres of healing addressed in the design scheme. [Author]

Figure 2 (Left): A diagram showing the need of a polluted river and a broken community to find healing in the new building.

Figure 3 (Right): The need to unite or redefine the relationship between psychiatric patients and society. [Author]



In the unfolding of the design you will notice that these four spheres of healing are sometimes purposefully superimposed over one another. This is evident in the choice of programme and the physical function of the structure. The proposal therefore can be explained as a water therapy facility – a hydrotherapy centre. 'Hydrotherapy' is the application of water for curing certain diseases, the word being derived from the Greek words "water" and "to heal". (KRUER, 1905: 361) Water has the ability to open up the contemplative nature of the soul and helps to draw out memories and a sense of belonging. (STARK, 2010) In addition to this psychological healing, the building also functions as a water purifying machine that sucks up water from the polluted Black River in order to use the clean, treated water for drinking, recreational and therapeutic applications in the intervention. This represents a tangible form of healing the environment and can also educate the visitor in water conservation, at the same time allowing him/her a safe, clean and healthy environment to live in.

I find the most exciting part of this project is that the functional water purification system has formed an integral part of the architecture – almost to the extent that the building is a filter and the filter becomes the building. The possibilities of generating forms and spaces with a fusion of functional and symbolic meanings and implications are rich and endless. Normally the design of water purification plants belongs in the scope of highly specialised engineering. However, by applying these principles to architectural design and not limiting it to engineering, I have found that an invigorating space of healing can be created where not only the occupant feels psychologically restored but where healing is also echoed in the physical structures of the space as the building becomes an active filter for cleaning water.

On a sociological level this facility would be of great benefit not only for the local community by providing employment and recreation but also for the vital reintegration of psychiatric patients with the everyday society. Mental illness in patients has always been an unfavourable topic. It is sad to see how most of psychiatric patients get rejected by society and their confined rehabilitation in psychiatric hospitals sometimes only succeeds in furthering the divide between society and the so called 'mental patient'. However it is proven that a person with any form of mental disorder can only benefit from being exposed to 'normal' conditions and to functional society. A sense of belonging and purpose is often the best gift of hope and renewal of spirit you could offer such a person. It is therefore critical that this design would serve to promote integration of mentally ill and physical disabled persons with the public.

The facility primarily focuses on three forms of rehabilitation that all employ water as a medium for therapy. They are: occupational therapy, psychiatric therapy and physiotherapy. These concepts are explained in more detail in the *Social Programme* section of this document. Hydrotherapy can be employed for both physical and psychological healing. For the purposes of this study and to draw a distinction between the two, I will call the therapeutic process of physical exercises in water as conducted by an occupational therapist 'aquatic therapy'. The water therapy used by psychiatrists for mental illnesses in patients, on the other hand, I will call 'thermotherapy'. This is because this process mainly draws on the therapeutic qualities of the difference in high and low temperatures easily produced by the effective conductivity of water.

SUPPORTING ENQUIRIES

At the start of this thesis project, a two-part academic research investigation was conducted that formed the theoretical basis for the design. One was a theoretical investigation and the other a technical investigation. The following section will serve to summarise the findings of both papers pertaining to the design scheme.

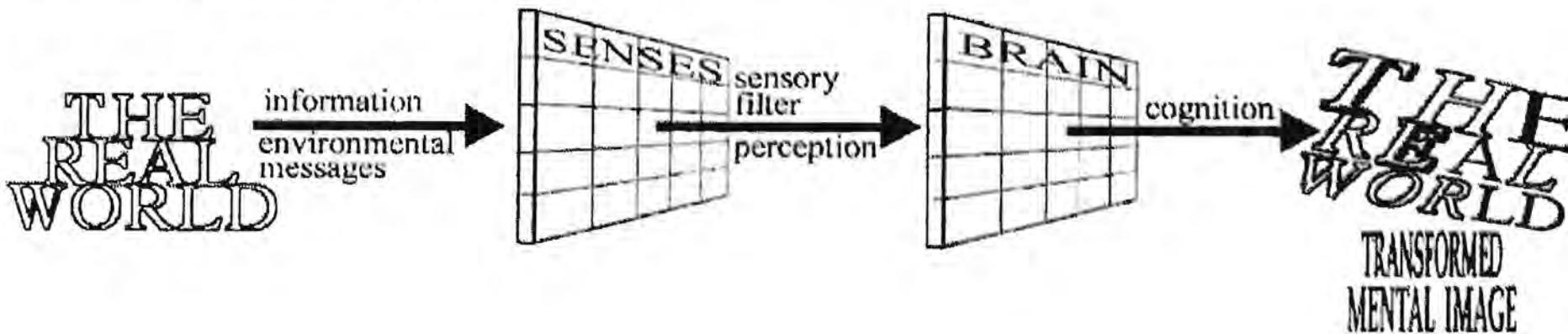
Theoretical Investigations

The theme I chose to explore in the Advance Theory Research Report was *The Psychology of water-use in Architecture*.

The aim with this theme was to search for an answer to the overarching enquiry of the architectural proposition: "can architecture have an effect on a person's wellbeing?" From this investigation the answer was proven positive. However, because my interest as mentioned in the introduction is two-fold (psychology of space and water in architecture) I set off in this paper to unpack both topics at length in order to help me better understand the design intentions and how to best go about designing such a structure.

Firstly the paper discusses the theories and history of environmental psychology which can be described in short as the study of human response to physical surroundings. I have found that this field of study is not only of interest to psychologists, but the nature of the problems and solutions with regards to it's subject matter is also of extreme value for us as architects. We have to know how the user's mind works in order to shape our forms so that we can not only positively contribute to that person's experience of the building but that we can also produce a richer architecture.

Secondly the paper unpacks the means by which the perception of space and environment are measured. What allows the mind to read the environment around it is the 'perceptual systems' as formulated by James Gibson in 60's. (GIBSON, 1968; 47) These systems are commonly referred to as the five senses: touch, smell, sight, sound, and taste. The positions of theorists such as Jean Baudrillard, Neil Leach, Douglas Pocock, and Juhani Pallasmaa have helped me to understand that by stimulating all the senses or at least more than one simultaneously through a person's physical surroundings one can contribute to that person's healing of the mind and body.



Below: The Information of Images created by Joy Monice Malnar and Frank Vodvarka. [MALNAR & VODVARKA, 2004]

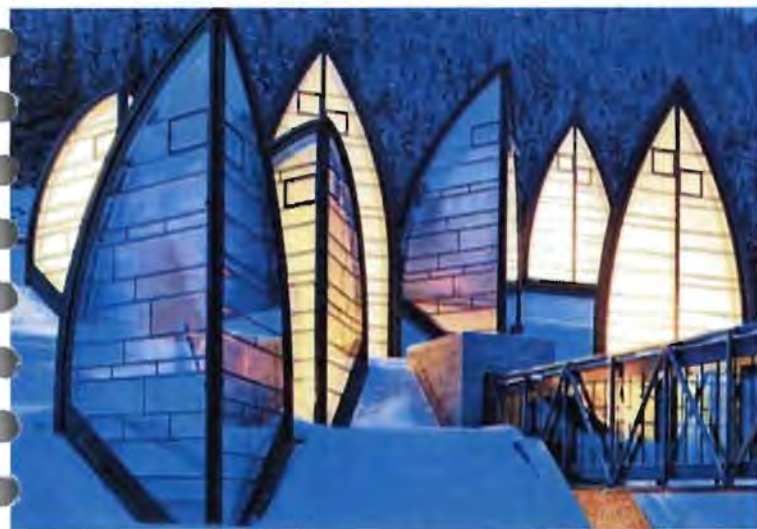
Right-top: The tree-shaped light wells are a metaphor for the surrounding alpine forest. The element brings energetic innovation and fun to the whole design. [1]

Right- middle: Indoor swimming pool at the : 'Tschuggen Bergoase' Wellness Centre. [2]

Right-bottom-left: The building's breath-taking natural setting. [2]

Right- bottom-middle: The water surfaces seem to flow continuously with the floor surfaces. [2]

Right-right: The use of natural stone and wood creates a rich, haptic experience for the user. [3]



The explanation is that the interaction of the different senses will confirm the reality of a person's experience. This is because there is more than one receptor of information at work. Confirmation of the reality puts the body at ease as it becomes familiar with the setting. Once the body is familiar with the experience, it holds a position of control. And only within control of the situation can the mind fully open; thus the perfect basis for the start of the healing process.

The essay then further discusses the stimulation of these five senses and their potential implementation in architecture in more detail. The idea was to propose a design tool that would aid in stimulating the senses of the occupant in the case of a design project like this one. Water was then proposed as such a device by which this can be achieved since it is unmistakable that water has the ability to evoke all five the main senses. The multi-sensory level of engagement with water allows people to touch, smell, taste, hear and see water. The conclusion then is that water that is used in architecture where people engage with it, can contribute to a person's sense of well-being by allowing an intensification of the senses. If architecture can provide a place where the senses are exercised in balance, it can allow a person's mind and body to open up to a healing experience. This notion has formed the premise of this thesis project.

After this it was thus necessary to examine not only the physical properties of water but also the psychological healing properties of water and its power in design. Hydrotherapy or 'water-therapy' is not a new concept. In fact the healing benefits of water were already known to ancient civilisations (Romans, Greeks, Japanese, Russians, etc.) centuries before our own. The essay briefly describes some of these civilisations' use of therapeutic waters and then further explains the concept of Hydrotherapy or the 'water-cure' and how this was implemented both positively and negatively in mental hospitals of the early 20th century.

A brief account of how water was used in architecture through time as a healing, recreational, and aesthetic element forms the remainder of the essay, concluding with a case study of a spa healing facility in Switzerland called, the 'Tschuggen Berggasse' Wellness Centre designed by Mario Botta. The photos on this page are from that case study.



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Technological Investigations

The second leg of the theory investigation was the Advance Technology Research Report which I labelled, *Thirsty Structures: Water Purification Systems in Architecture*.

This essay was a study into the notion of a building being more than just a shelter - a building that is active in the environment around it. The theme for the report finds its basis in the enquiry of the design proposal mentioned previously. It explores methodologies and systems of creating active buildings that can literally filter and purify polluted water through its own skin or structure.

The aim of the study was to familiarize myself with conventional processes, techniques and methods of drawing or pumping water into buildings in order to recreate an innovative water purification system that will be applied in the design project of this thesis. In this study the theme of healing takes on a more literal and almost mechanical approach. The format of the argument takes on the shape of a brief discussion of the principles of water purification (which I will explain in the *Design Development* section of this paper) and then follows to unpack a series of case studies that are predominantly projects which are either a water purification facility drawing polluted water from a river; or a treatment plant which filters wastewater before the effluent is discharged back into the river.

The conventional water treatment processes are discussed and critiqued. There are two main types: **chemical water reclamation plants**, usually designed by hydraulic and chemical engineers or highly trained specialist, or **biological water filtering systems** such as constructed wetlands, designed by landscape architects and ecologists. In the document I raised the concern that architects are too often left outside of these design process and cannot really contribute to the discussion due to lack of knowledge or expertise with regards to the topic. My aim with the thesis is to contest this and prove that architects can reinvent conventional and conservative systems, reforming them and applying them to an architecture that is enriched both spatially and functionally – ultimately improving the environment and positively affecting the occupant's sense of wellbeing. The conclusions drawn from this critique of chemical and biological treatment systems are:

- Chemical processes are highly efficient but often toxic gas makes it unsafe and the machines and water tanks are usually unsightly.
- Constructed wetlands are far more pleasing to the eye but it is very difficult to recollect water for human-use after it has gone through the filtering system of the plants and soil without reverting back to a mechanical or chemical process.

The subsequent case studies then try to demonstrate a more unconventional approach to water filtering where these systems are either combined or where whole new innovative filtering systems are implemented in the design, creating exciting new possibilities in architecture.

All the case study examples filter water one way or the other and they have very different approaches to this solution. I have given them a collective name of **architectural water purification systems** and have organised them in four categories: Skyscraper Filters, Skin Filters, Kinetic Filters, and Floating and Swimming Filters. Here is a quick summary of these cases:

Skyscraper filters - *The Freshwater Factory, eVolo Skyscraper Competition designed by Design Crew for Architecture(2010)*. This tall tower is able to turn salt water efficiently and sustainably into fresh drinking water. This is achieved by filtering salty water through a series of mangrove plants (well known for their unique ability to thrive on salt water and perspire freshwater) housed inside spherical greenhouses where the round shape allows water to condense on the sides and trickle down the bottom where it is collected and then drained out of the building to surrounding agricultural fields.

Skin filters - *The Ciliwung Recovery Project, Jakarta, Indonesia (2010)*. This massive building features an integrated filtration system that purifies the polluted rivers of the city of Jakarta. The structure consists of a spine of tubes that carry water to and from the river via capillary action and that forms the skin of the structure for a housing scheme. Inside the skin, solids are separated out and are then processed into fertilizer and the water is used in various applications.

Kinetic filters - *Synchronicity Island, Warsaw, Poland (2009)*. This is essentially a human powered water purification island that consists of a floating platform on which exercise equipment are placed. The exercise bike and treadmill machines are hooked up to a kinetic pump that pumps polluted water from the Vistula River through up to four filters overhead. Excess clean water spills over into a large drinking fountain. This allows users to rehydrate with a cup of the fresh filtered water after the exercise. The concept aims to empower citizens toward environmental clean-up by involving human action in the process of renewal.

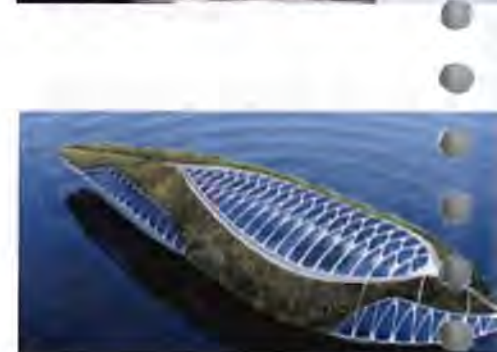
Floating and swimming filters - *'Physalia' by Vincent Callebaut*. This idealistic 'physalia' is an architectural prototype of an amphibious garden that floats on top of the polluted rivers of Europe while simultaneously filtering and purifying the water. The multi-hull steel structure is clad with an aluminium skin and is then covered by a Titanium dioxide layer that reacts to ultraviolet rays and hence reduces water pollution. Furthermore the double hull houses a hydraulic network that also filters the fluvial water and purifies it biologically thanks to its planted roof.

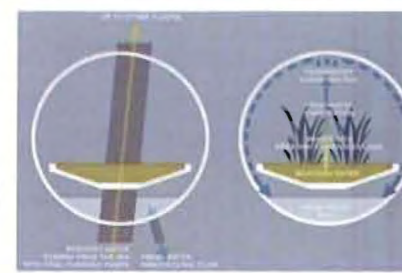
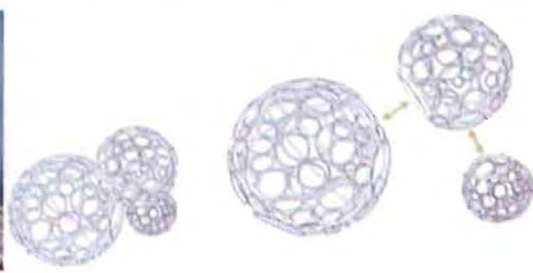
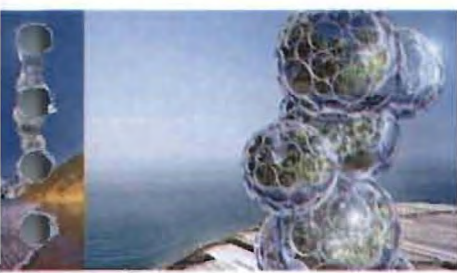
First strip: Skyscraper Filters – The Freshwater Factory. [4]

Second strip: Skin Filters – The Ciliwung Recovery Project .[5]

Third strip: Kinetic Filters – Synchronicity Island, Warsaw.[6]

Fourth strip: Floating and Swimming Filters – 'Physalia' by Vincent Callebaut. [7]





water spine



green layer



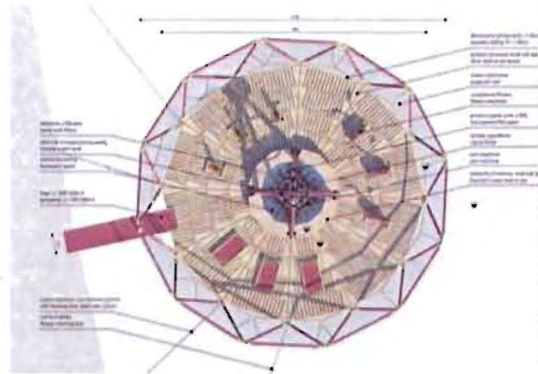
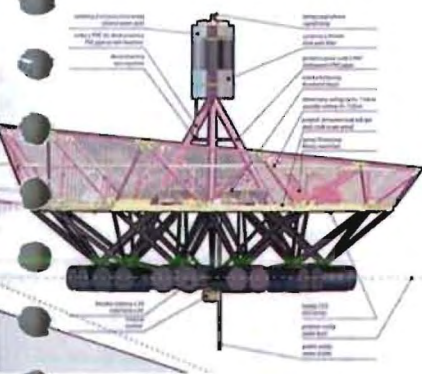
functional space



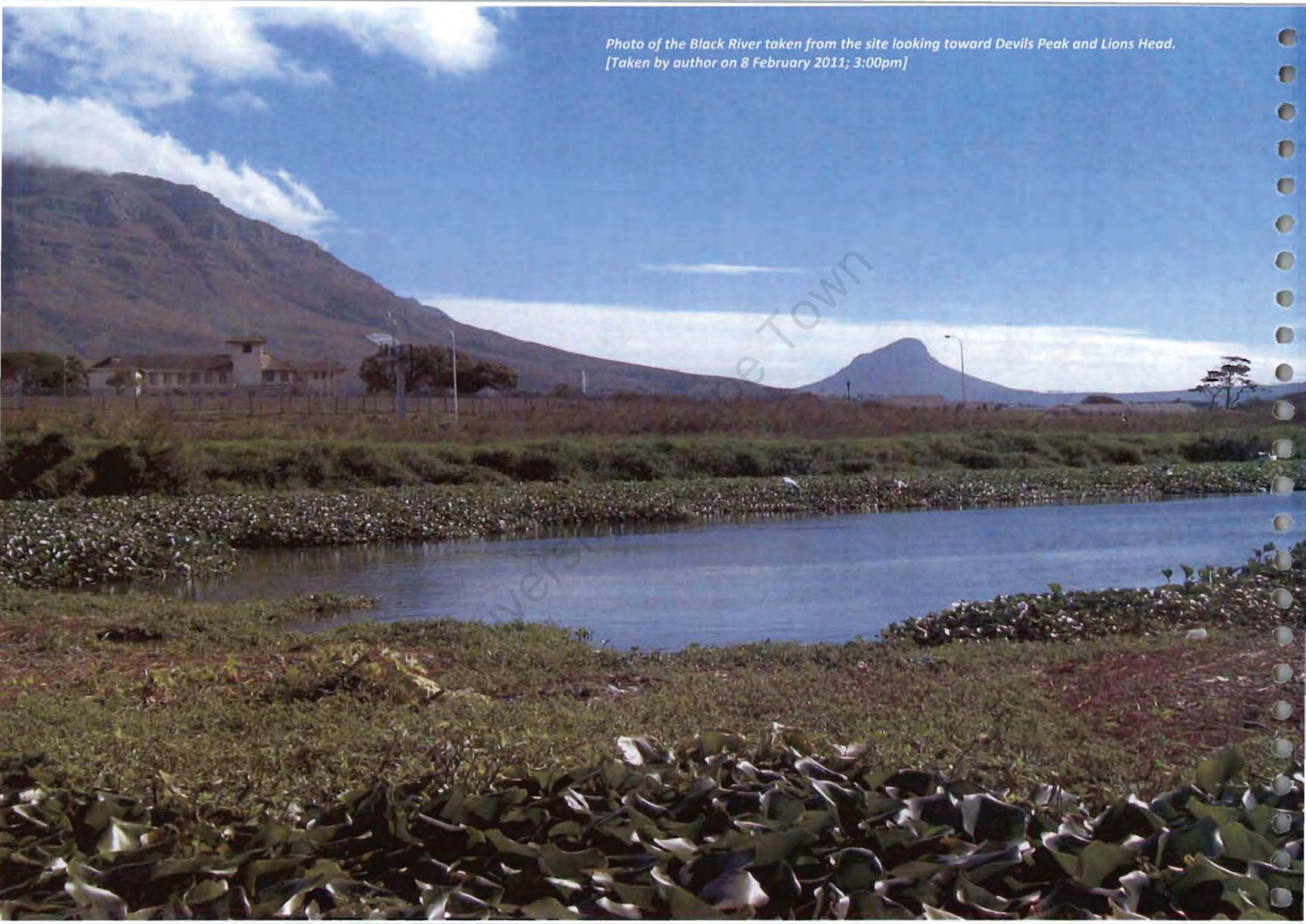
wind turbine
and solar reactor

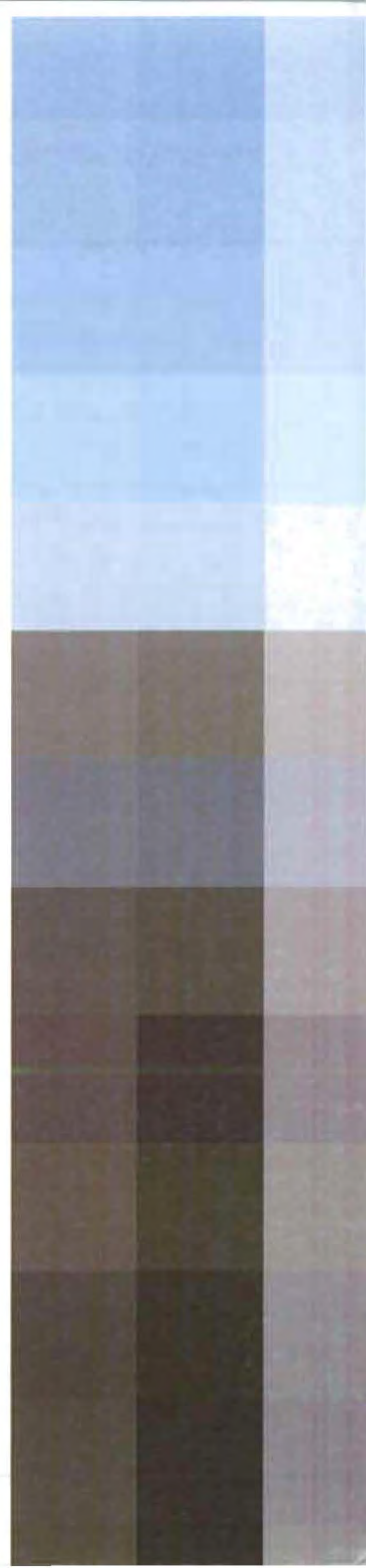
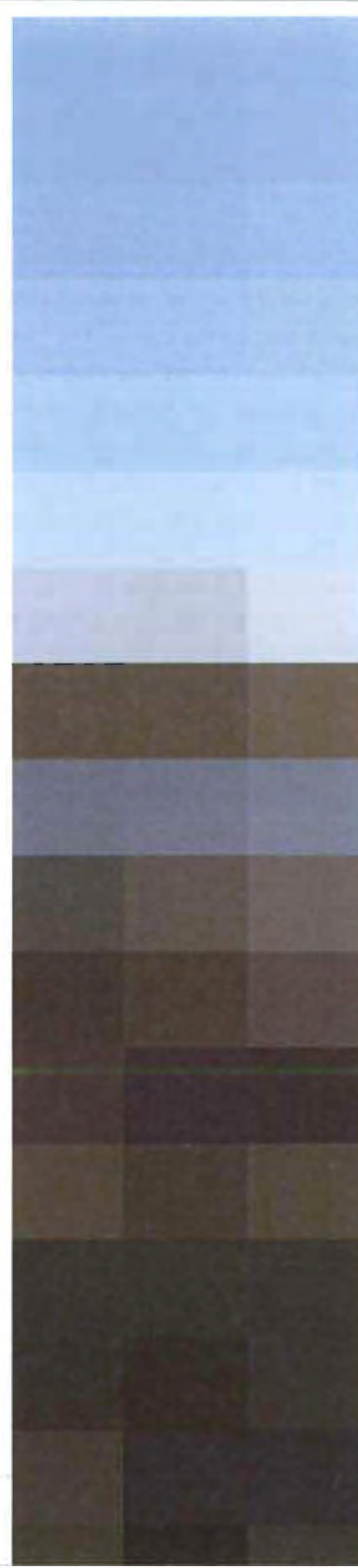
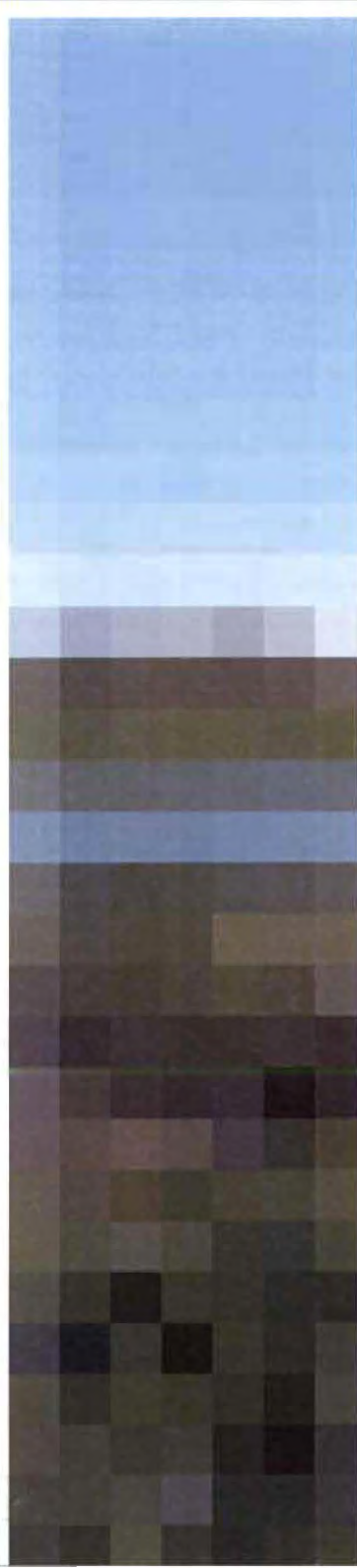


structure



*Photo of the Black River taken from the site looking toward Devils Peak and Lions Head.
[Taken by author on 8 February 2011; 3:00pm]*





SITE EXPLORATIONS

Site Overview

The site that I found best suited for the unfolding of this thesis is a fairly large piece of land close to the confluence area of the Liesbeek and Black Rivers that forms part of the Two Rivers Urban Park (TRUP). This park was initiated in 2002 and is still in the development phase. The area stretches from Hartleyvale Stadium in the west, across the Valkenberg Psychiatric complex, the River Club and The Old Observatory all the way to the Alexandra Institute on the Pinelands side east of the Black River. It encompasses both the Liesbeek Parkway and Black River Parkway highways running through the park from the south to the north and also both rivers of the same names respectively. (SEE LOCATION PLAN AND PRECINCT DEMARCATION) Currently the site is used as an informal driving range for the Mowbray Golf Club.

Surprisingly the Liesbeek River is the cleanest river in Cape Town while the Black River is by far the most polluted. There is an unacceptably high level of e-coli bacteria in the Black River which makes it unsuitable for any agricultural, drinking or even recreational use. This is due to the sewage leaking into the river from the Athlone Sewerage Plant further up along the river. The site hugs this dirty river along the western boundary and is the perfect platform for the experiment in a water purification system that would create the desired healing architecture of this thesis project.

With the advent of rapid urban growth of the previous century, the Black River was canalised in 1941 to prevent the increase in flooding of the river banks. However this has led to a devastating impact on the surrounding eco-systems. (RIVERS OF THE WORLD. 2007) In addition the river is overgrown with alien species such as hyacinth (apparently a direct result of the sewage polluted water). This causes further problems in winter months when the river is flooding. Thus far, a manual method of cleaning the river has been employed, but has proven to be too dangerous due to the high e-coli count. This thesis project aims to provide an alternative solution to this problem which will be discussed in more detail further on.

The surrounding sites have reinstated sensitive areas of wetlands and other indigenous plants and eco-systems. However, currently this particular site is not yet restored in the same fashion and holds massive potential for a truly environmentally sensitive, yet striking new intervention.

Birds-eye view of the Two Rivers Urban Park with the chosen site as indicated. [8]




Next Page: Aerial photograph of the same area. [GIS maps. 2009]





TWO RIVERS URBAN PARK - PRECINCT DEMARCATION

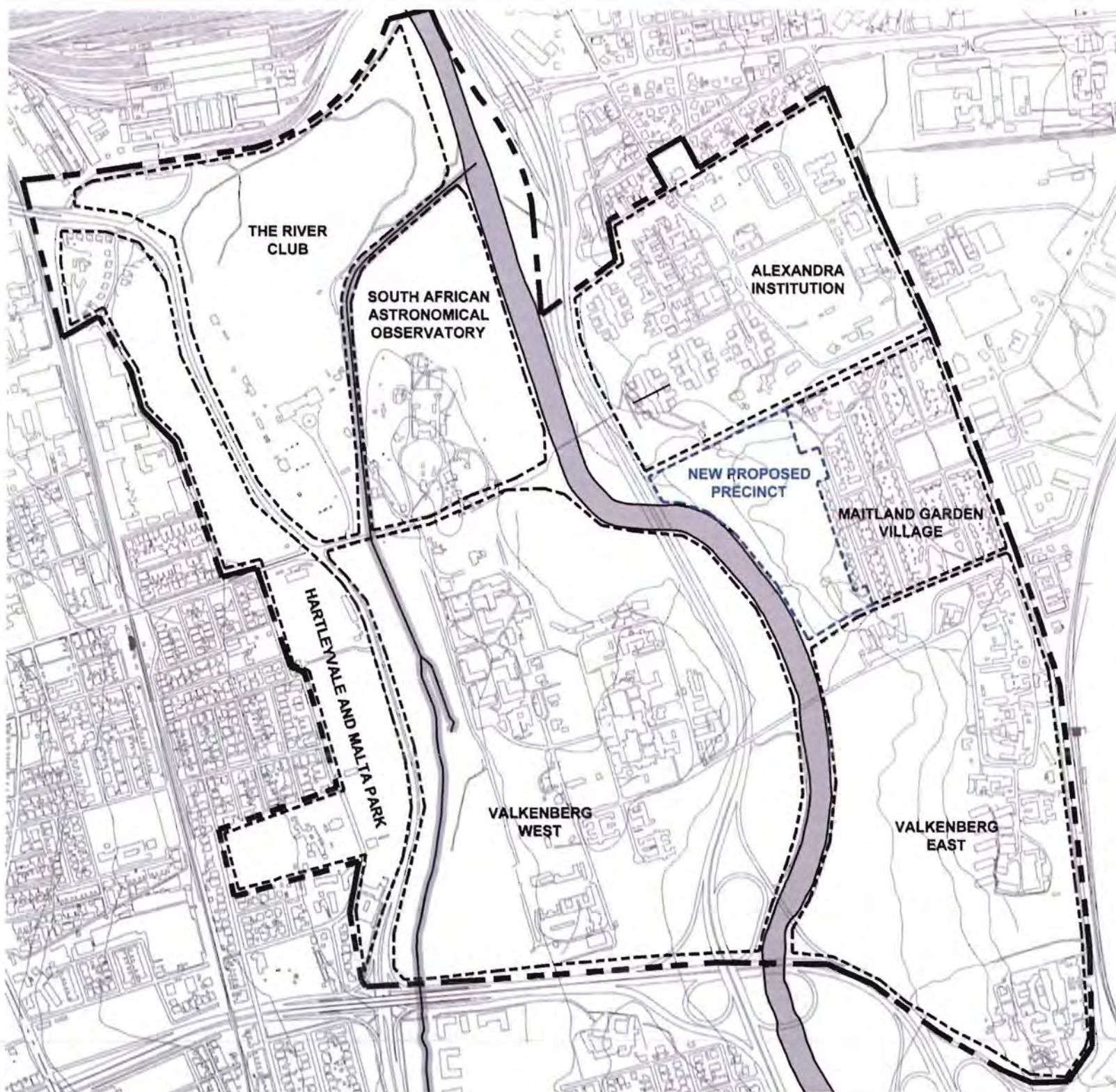
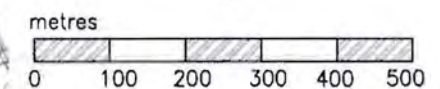
LEGEND

-  Two Rivers Urban Park Boundary
-  Precinct Boundaries
-  Major Rivers

CHARACTER OF EACH PRECINCT

- THE RIVER CLUB**
Commercialised Sport and Recreation
- SA ASTRONOMICAL OBSERVATORY**
Environmental Education and Institutional
- HARTLEYVALE AND MALTA PARK**
Sport and Recreation
- VALKENBERG WEST**
Commercial, Institutional and Residential
- VALKENBERG EAST**
Commercial, Institutional, Residential and Recreational
- MAITLAND GARDEN VILLAGE**
Residential
- ALEXANDRA INSTITUTION**
Institutional
- NEW PRECINCT**
Institutional, recreational

[CoCT. 2002] Redrawn by author.

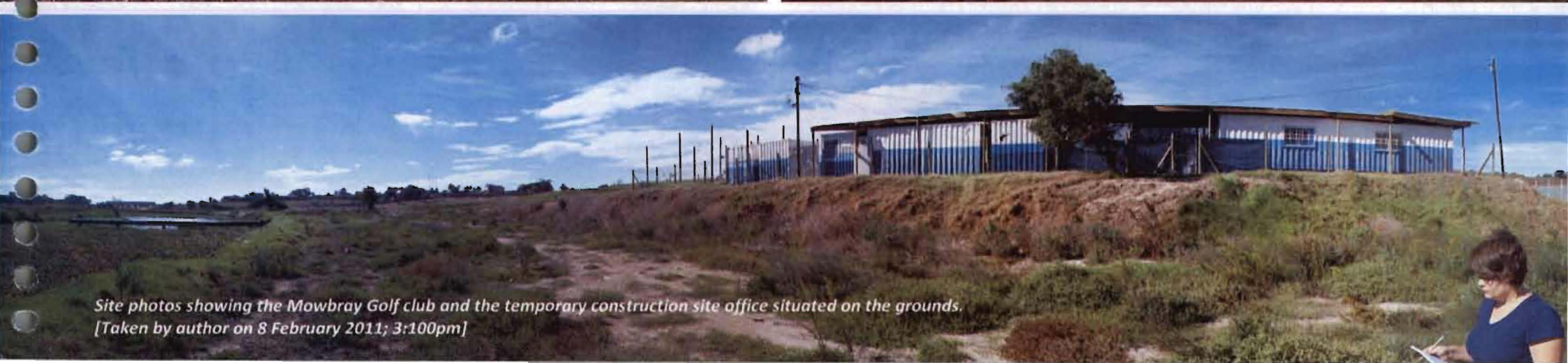




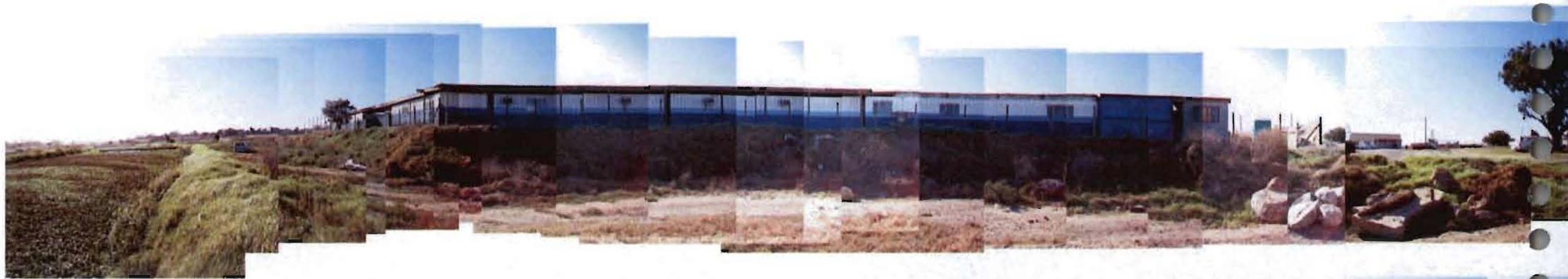
In winter the river needs to be kept clear of water hyacinth because of the danger of flooding the surrounding areas when it rains. If the river is full of water hyacinth water cannot flow away quickly. Reeds on the river bank also cause problems as the water hyacinth packs up against them. The hyacinth that is removed from the river manually can be used as a resource to create compost, paper and other products. The stems are very strong and can thus be used as a weaving material. This opens up an opportunity for economic income for the local community. (IDEAS FROM MILES GILJAM'S 1999 THESIS, "THE DISTRIBUTION AND POTENTIAL RESOURCE USE FOR WATER HYACINTH IN THE GREATER CAPE TOWN AREA.")

Photos of the overgrown hyacinth in the Black River. [Taken by author on 8 February 2011; 3:20pm]





*Site photos showing the Mowbray Golf club and the temporary construction site office situated on the grounds.
[Taken by author on 8 February 2011; 3:100pm]*





Strip elevation from southern side of the site looking North at the temporary construction site office. [Taken by author on 8 February 2011; 3:30pm]



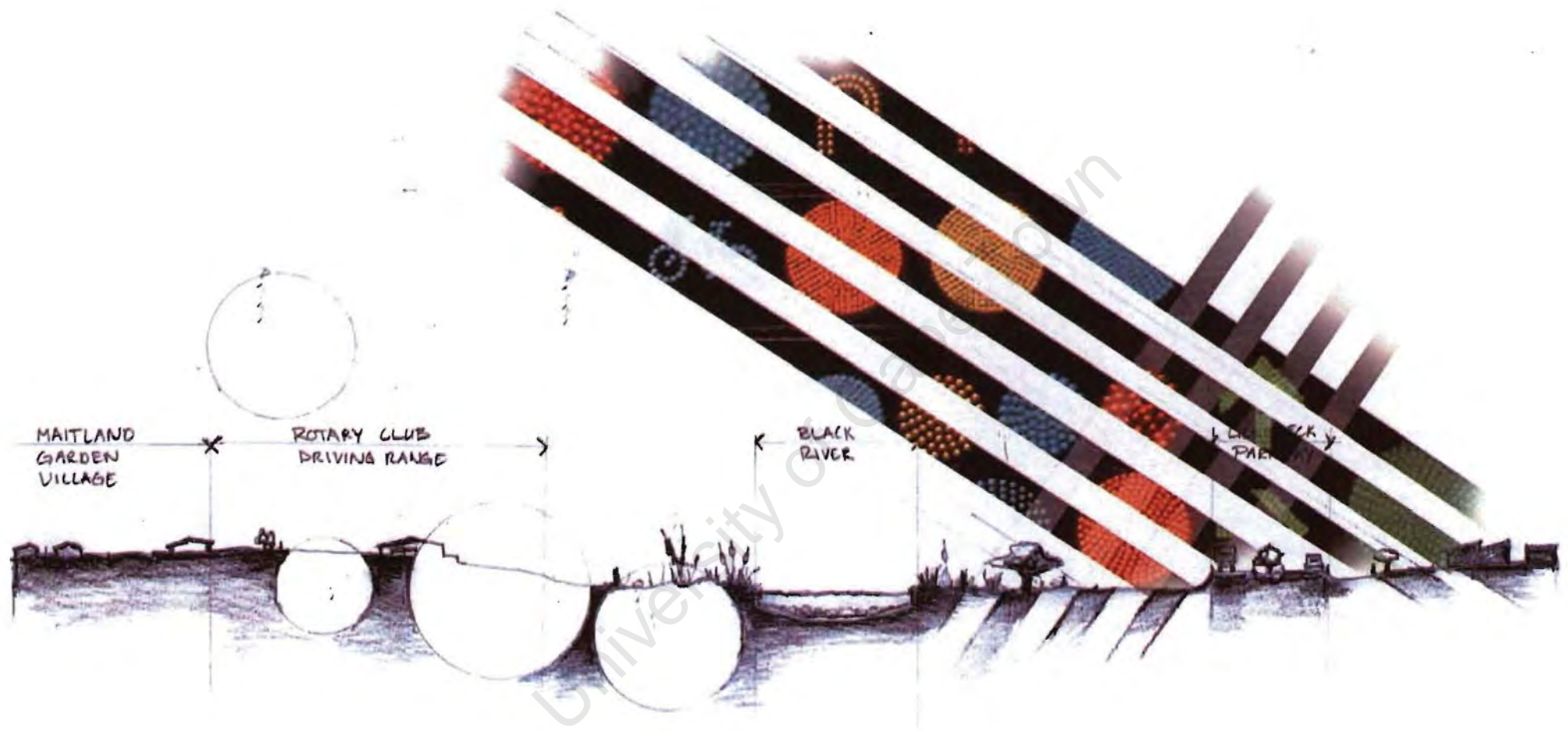
Strip elevation from middle of the site looking North at the Mowbray Golf club tee-off and parking area. [Taken by author on 8 February 2011; 3:30pm]



Strip elevation standing in the middle looking south to the golf clubhouse. [Taken by author on 8 February 2011; 3:30pm]



Strip elevation at the northern end looking North to Alexandra Rehab centre and the marshland next to the river. [Taken by author on 8 February 2011; 3:30pm]






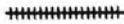

An intuitive sketch of a diagrammatic section through the site. The drawing tries to depict a personal perception of the setting and the experience felt on site. The wind was blowing fast from the north-west (right-hand side of sketch) The only sounds were that of the overpowering traffic from the Black River Parkway. The holes in the drawing symbolise the areas I could not get to due to golf balls flying overhead from the golf club tee-off area. [Author]

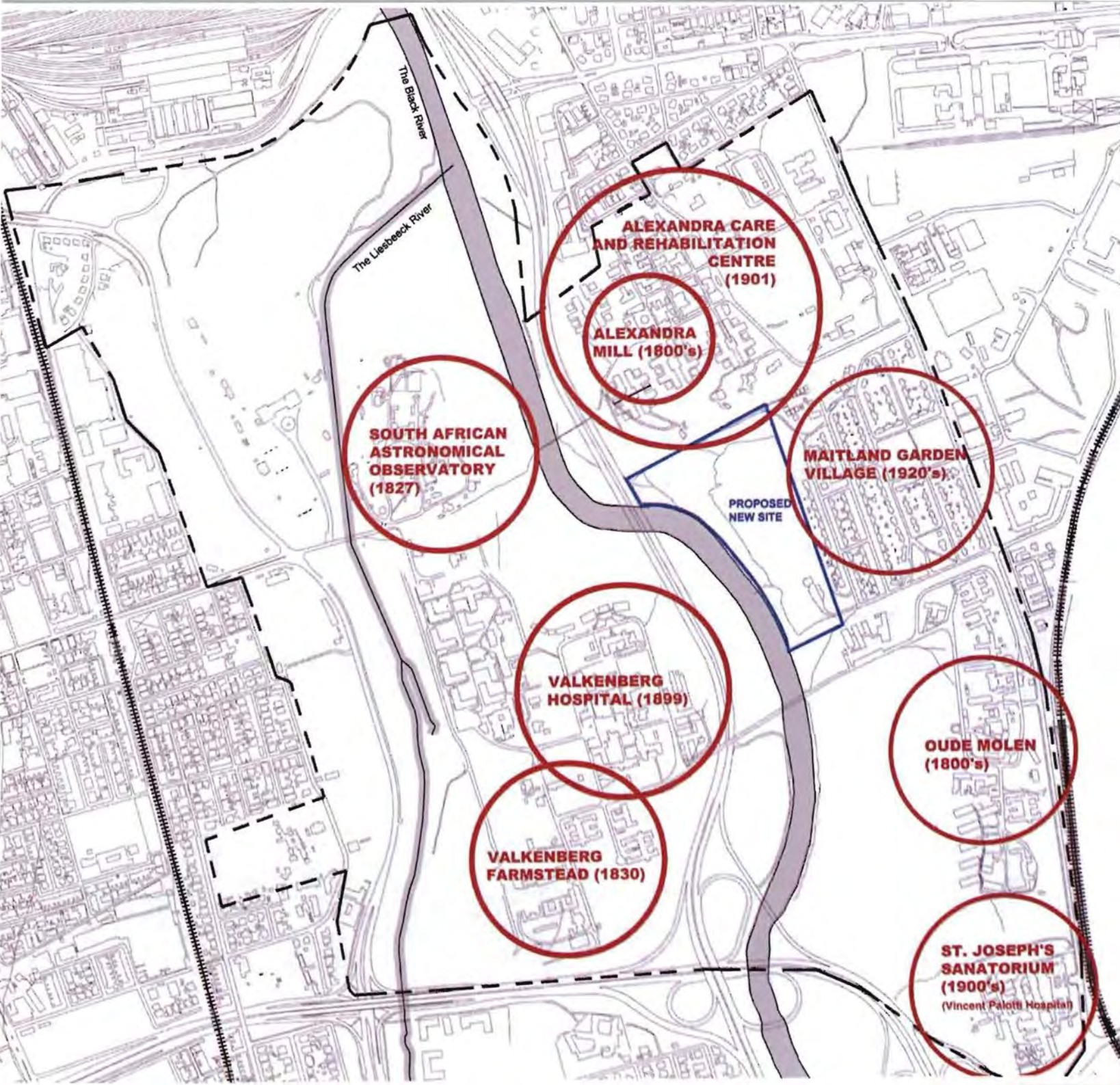
Another sketch depicting the first attempt at what the site could look like with a reimagined environment and river-edge. [Author]



HISTORICAL SIGNIFICANCE

LEGEND

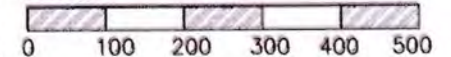
-  Two Rivers Urban Park Boundary
-  Major Rivers
-  Sites of historic cultural or archaeological value
-  Railway lines
-  Proposed site



[CoCT. 2002] Redrawn by author.



metres



Historical Significance

The surrounding area of the site is not only appealing from an environmental point of view but also holds remarkable historic value noticeable from as early as the 1700's. The banks of the river were at first used by Khoe farmers as grazing ground for their cattle and before colonial occupation in 1652 the confluence area of the Liesbeek and Black rivers formed an essential part in their spiritual and cultural rituals. (RIVERS OF THE WORLD. 2007)

Around 1693 the *Dutch East India Company (VOC)* assigned land to *vryburgers* who were to plant wheat fields and erect a mill for the production of food for the colony and sailors passing by the Cape of Good Hope. The area then became known as *Molenvliet* (Mill river/valley). *Molenvliet* farm was sold in 1725 after which the original water mill was replaced by a new mill in the area that today is known as the **Oude Molen**. It is said that the *Oude Molen* complex today may still incorporate 18c fabric in the ruins of the demolished buildings.(AIKMAN ASSOCIATES. 2002: 5.2)

The neighbouring farm was called **Valkenberg** which lends its name to the psychiatric hospital later constructed in 1899 and which is still functioning today. This hospital was the first mental asylum designed according to modern principles. The symmetrical layout is typical of the 19c institutional complexes and is thus at present proclaimed a Provincial Heritage Site. (AIKMAN ASSOCIATES. 2002: 5.2) The manor house on the Valkenberg Farmstead complex dates from about 1830 but it is said that it probably also incorporates fabric dating from the early 18c. Most of the elements were modified and extended by the Mostert family who initially owned the land and then by the reformatory and hospital authorities later on. Today the manor house and outbuildings form part of the Courtyard Hotel complex. The farmstead is the only remaining one on the Liesbeek River still retaining a sense of its agricultural history. It too, is proclaimed a Provincial Heritage Site. (AIKMAN ASSOCIATES. 2002: 5.2) The chosen site for this design project sits further north of the homestead and forms a part of the original *Valkenberg* farm but has in itself experienced little development since the farm was handed over in 1716. (MAKEKA. 2010)

It is reported that it was Florence Nightingale who first introduced the idea that patients could experience increase in healing time when exposed to the tranquillity of nature and that there were psychological and physical benefits in doing so. In 1959 the British government saw the two rivers confluence area as the ideal opportunity to test Nightingale's theories. Hence a policy was employed in the vicinity that would allow new interventions to maximise views out to the mountain, making the most of the river and using the surrounding landscape as a tool in promoting a sense of wellbeing and healing. Unfortunately the ideas and uses for the area were not always this noble as the *Oude Molen* buildings were also at some point during the later colonial period used for incarcerating political prisoners and local leaders. It is reported that even the great Zulu King Cetshwayo was housed here for a short period before his enforced journey to England to meet Queen Victoria.(MAKEKA. 2010)

Other significant historical sites that form part of the TRUP area are **The South African Astronomical Observatory**, **Maitland Garden Village**, and the 18th century **Alexandra Mill** that is situated inside the precinct of **Alexandra Care and**

Rehabilitation Centre. The original observatory building dates from 1827. Unlike Valkenberg hospital, the observatory complex layout is informal and buildings are loosely arranged in a park-like fashion. It is South Africa's oldest scientific institution and is thus a National Heritage Site. (RIVERS OF THE WORLD, 2007) Maitland Garden Village again is significant for its planning conventions developed by Ebenezer Howard in his original plan for Pinelands Garden City. It is almost unaltered since its construction in the 1920.s. This makes it unique in SA.s planning and architectural history. (AIKMAN ASSOCIATES, 2002: 5.2)

Prior to the commencement of *Valkenberg Psychiatric Hospital*, the grounds were also used as a military barracks. The region has played different roles throughout its history but has always primarily been a healthcare institution with its supporting functions as a place of healing and wellbeing. (MAKEKA, 2010) However, today the whole area including *Vlakenberg Hospital*, *Oude Molen* and *Maitland Garden Village* is experiencing a serious decline in maintenance. In addition, despite the efforts of the Two Rivers Urban Park managing team to restore the wetlands to its original state, the pollution of the Black River makes it an unappealing and even dangerous place and its role as a place of healing within the city is deteriorating rapidly.



EXISTING
SITE PLAN
SCALE 1:1000

University of Cape Town

MAITLAND GARDEN VILLAGE

BLACK RIVER PARKWAY




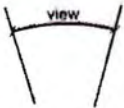
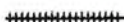


THE BLACK RIVER

VALKENBERG

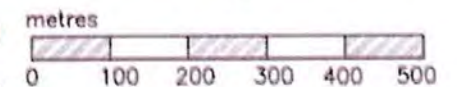
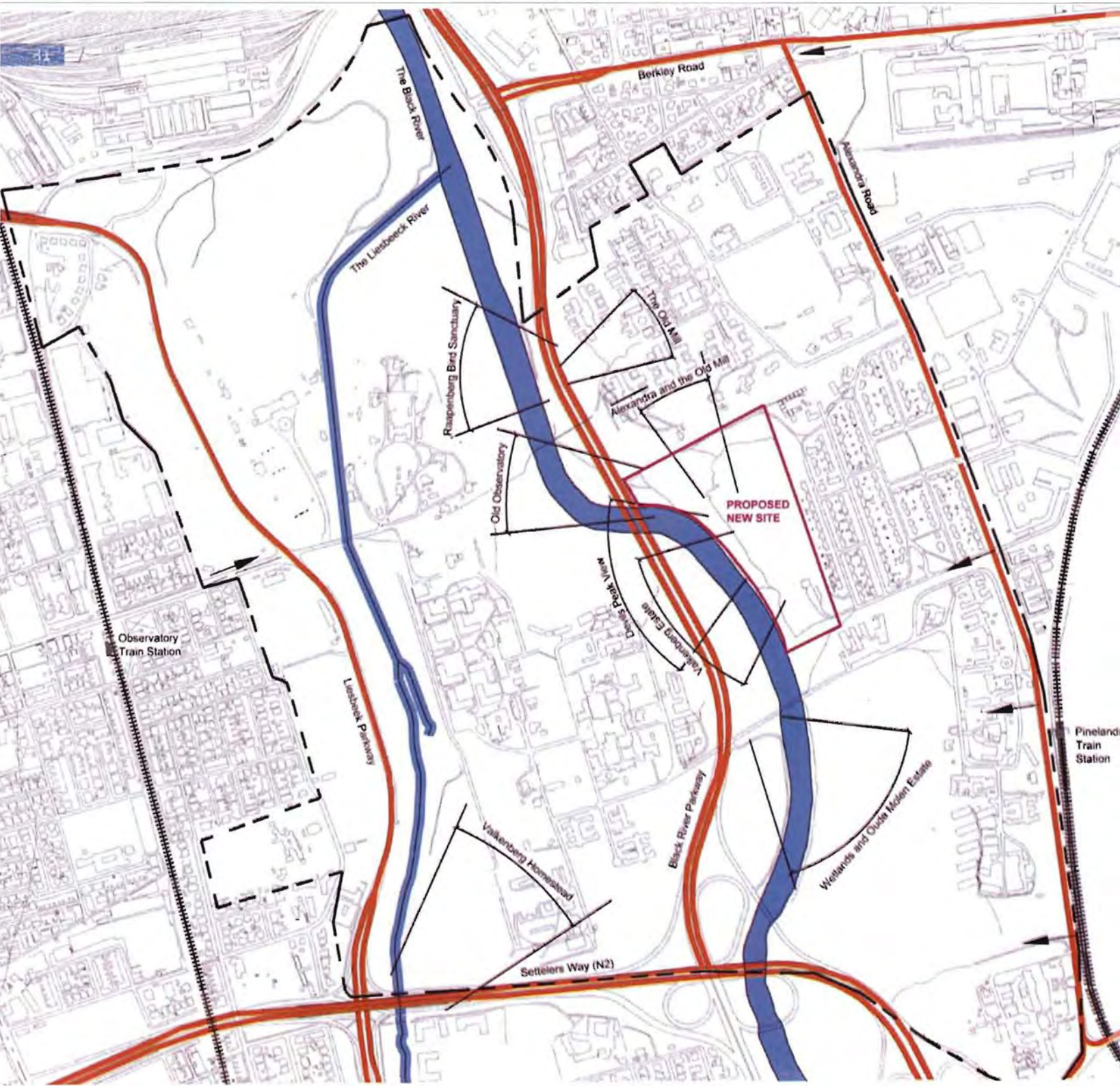
ALSTONIA GATE VILLAGE

STRUCTURING ELEMENTS






LEGEND

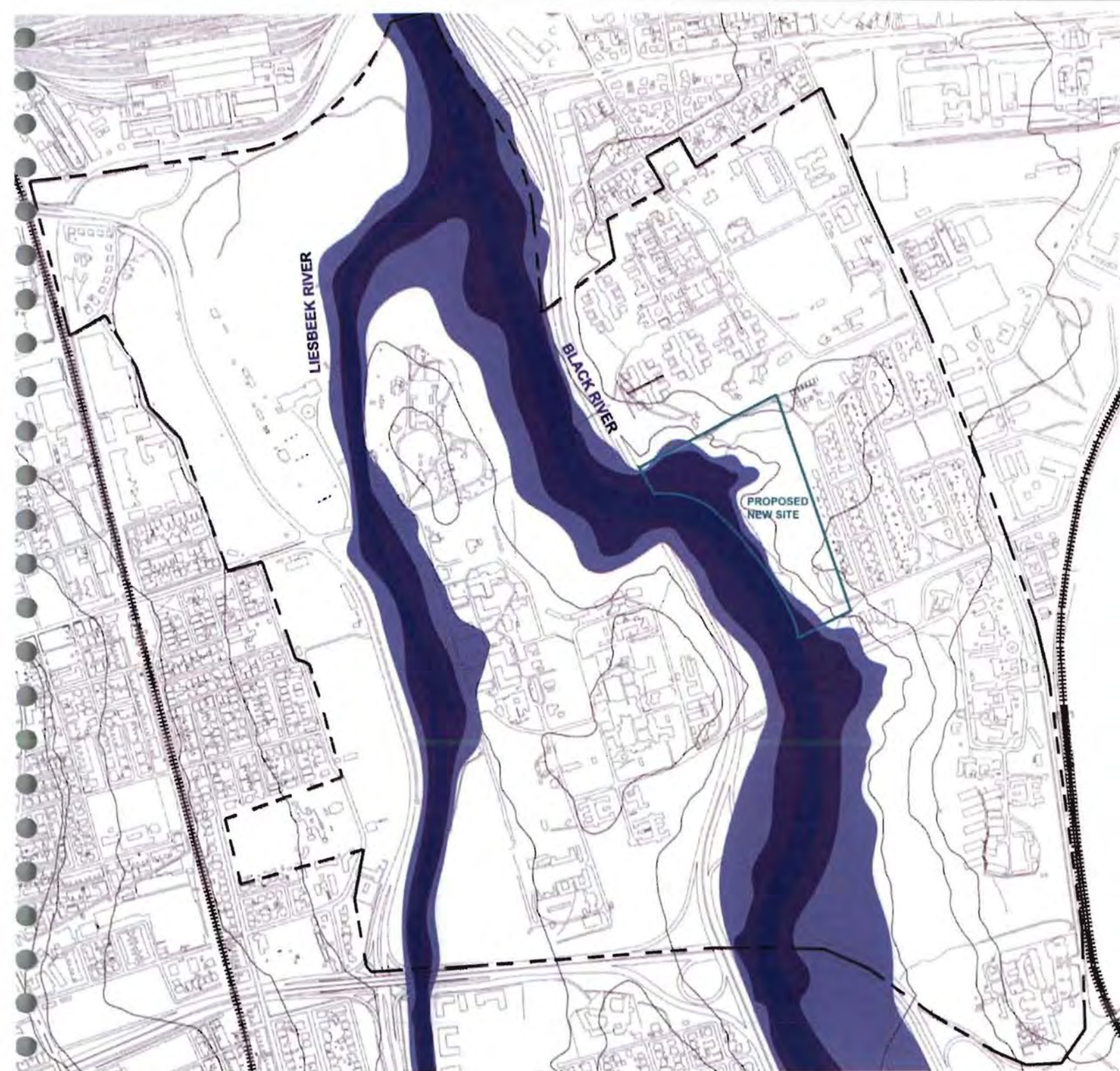
-  Two Rivers Urban Park Boundary
-  Major Rivers
-  Major Roads
-  Views and Vistas
-  Railway lines
-  Proposed site
-  Access points into the park

[CoCT. 2002] Redrawn by author.

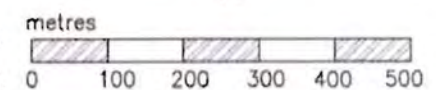


LEGEND

-  Two Rivers Urban Park Boundary
-  Normal River Condition
-  1 in 20 year floodplain
-  1 in 50 year floodplain
-  Proposed site



[CoCT, 2002] Redrawn by author.



Site Framework






Due to its significant institutions, historical buildings, cultural landscapes and sensitive ecological systems the Two Rivers Urban Park is the ideal location for the creation of a park that fulfils a variety of human and ecological needs, responding creatively to the unique environment. The managing team of the TRUP have put together an extensive spatial development framework for any new development in the area. For the design of the new precinct that I propose for this site, I have taken into consideration their requirements and have found it a very helpful exercise in formulating my own thesis enquiry and the subsequent design. The table on the next page shows a list of the relevant design considerations and reasons for the decisions made pertaining to the new intervention. In order to justify these decisions I have critically evaluated every resolution according to the impact it will have on the overall park.

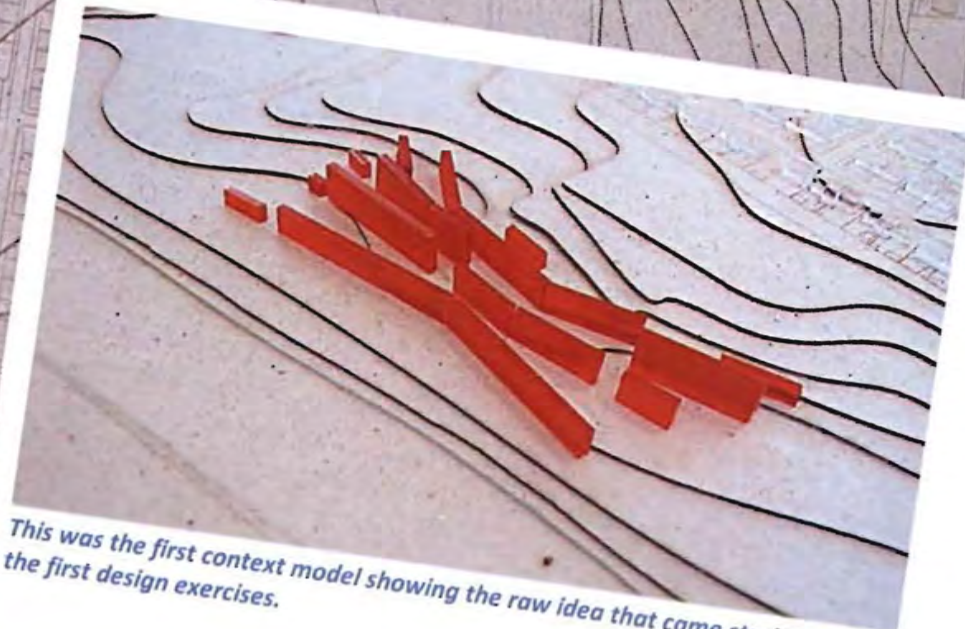
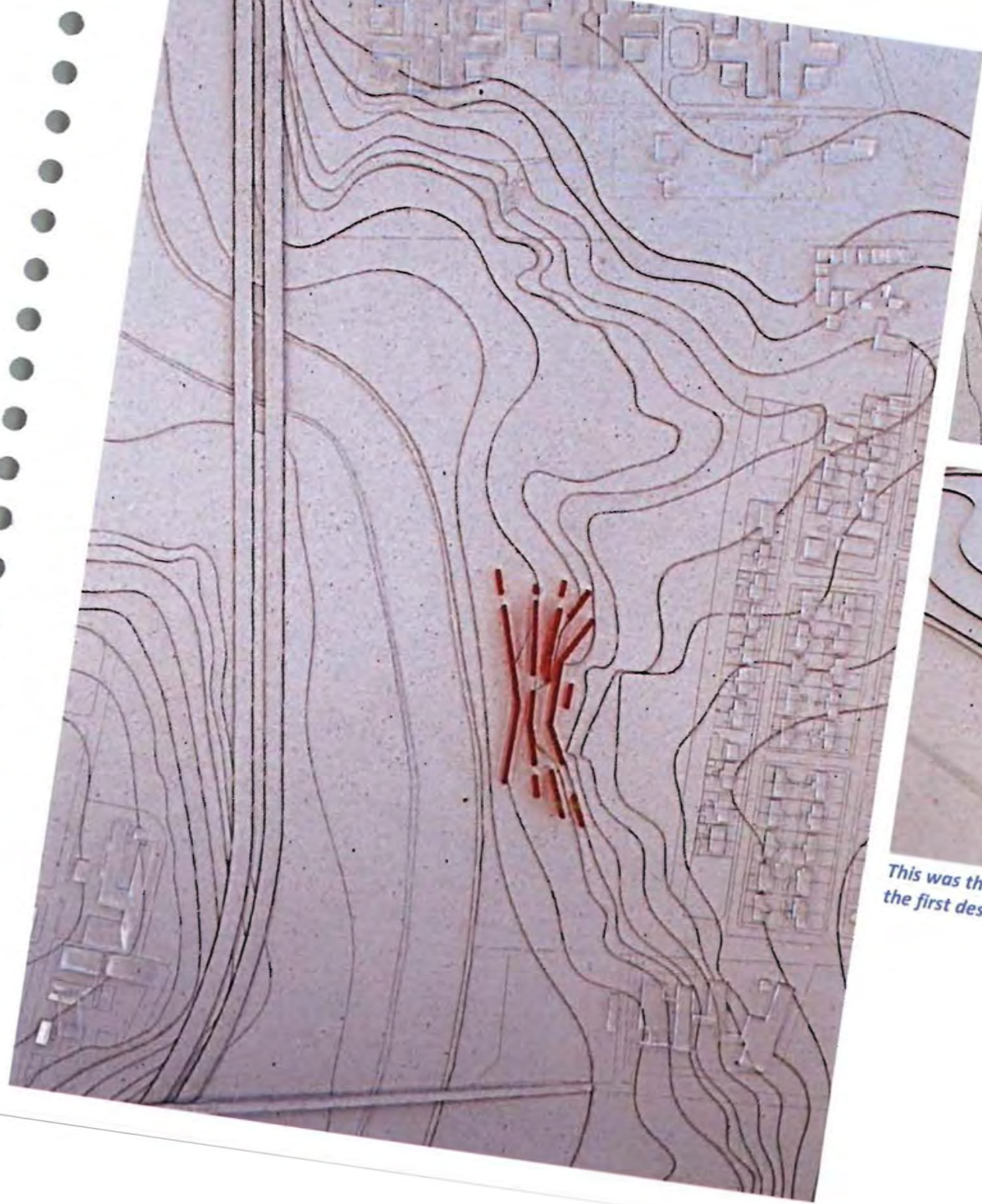
A simple urban design exercise (SEE SITE PLAN ON THE NEXT PAGE) also indicates the resolution of these considerations. These landscape and urban interventions have rightly served to enhance the programme of the building and its theme of healing.

TWO RIVERS URBAN PARK SPATIAL DEVELOPMENT FRAMEWORK: New Precinct Design Considerations

Any new development to the TRUP site must adhere to the following

	Existing Condition	New Proposal	Notes
Environmental Concerns	The development proposals would not result in any significant ecological impacts, with the exception of the proposed bridge in close proximity to the Valkenberg Wetland.		Given the nature of the project, the odds must be weighed.
	Development should be kept outside the 50-year flood plain.		
	Integrated management and development principles shall pertain to the sustainability of resources and materials, specifically with regard to water, power and waste.		
	The built environment shall be considered within the context of the existing and demolished footprints.		
	The bulk of development shall be considered with due recognition of architectural and aesthetic considerations		The existing site has very little aesthetic value.
	Integrated water catchment management principles should inform appropriate usage and development below the 1 in 50-year flood line.		
	Rehabilitate, protect, secure and enhance the intrinsic ecological qualities of the area.		
	Encourage environmental education.		
	Conserve the unique cultural landscape and promote sustainable development.		
	The possible widening of the Black River to accommodate future runoff from the catchment would negatively impact on the Raapenberg wetlands.		Given the nature of the project, the odds must be weighed.
Economic Concerns	Provide a higher diversity of suitable habitats for waterbirds by means of appropriate islands or indigenous trees and shrubs.		
	The Park is not financially viable in terms of the development scenarios presented in the SDF, and therefore alternative funding would have to be sourced.		The fact that the new intervention would be a health institute, will encourage National State funding and the nature of the project will attract overseas donor funding or additional funds donated by interested and affected parties.
	Explore the possibility of urban agriculture within the park.		
Social Concerns	All precincts shall adhere to an ethical, common identity as part of the Park.		
	There shall be recognition of social responsibilities with regard to the institutional heritage of the site, the potential contribution of NGO's/CBO's, and the principles of empowerment and job creation for local and metropolitan communities.		Local community will have opportunities to be employed by the managing board of the main facility or could be self-employed with small crop farming by means of the urban agriculture program.
	Cognisance shall be taken of cultural and social significance of all recognised sites.		
	Safety and security shall be integral principles of all the precincts.		New development will provide much needed surveillance of the area.
	There shall be maximum public access where feasible.		More access routes to and from the facility will be implemented.
	Transport management shall recognise the desirability of low traffic densities, minimal road networks and appropriate modes of transport.		
	Maximise opportunities for all people.		Employment, health care, recreation, etc.
	The underutilised land on the edges of the Park and adjacent to existing buildings could be utilised for development to enhance the wetlands and rivers as a passive recreational amenity or resource.		

SYMBOL	neg-						pos+
	LEVEL OF IMPACT						



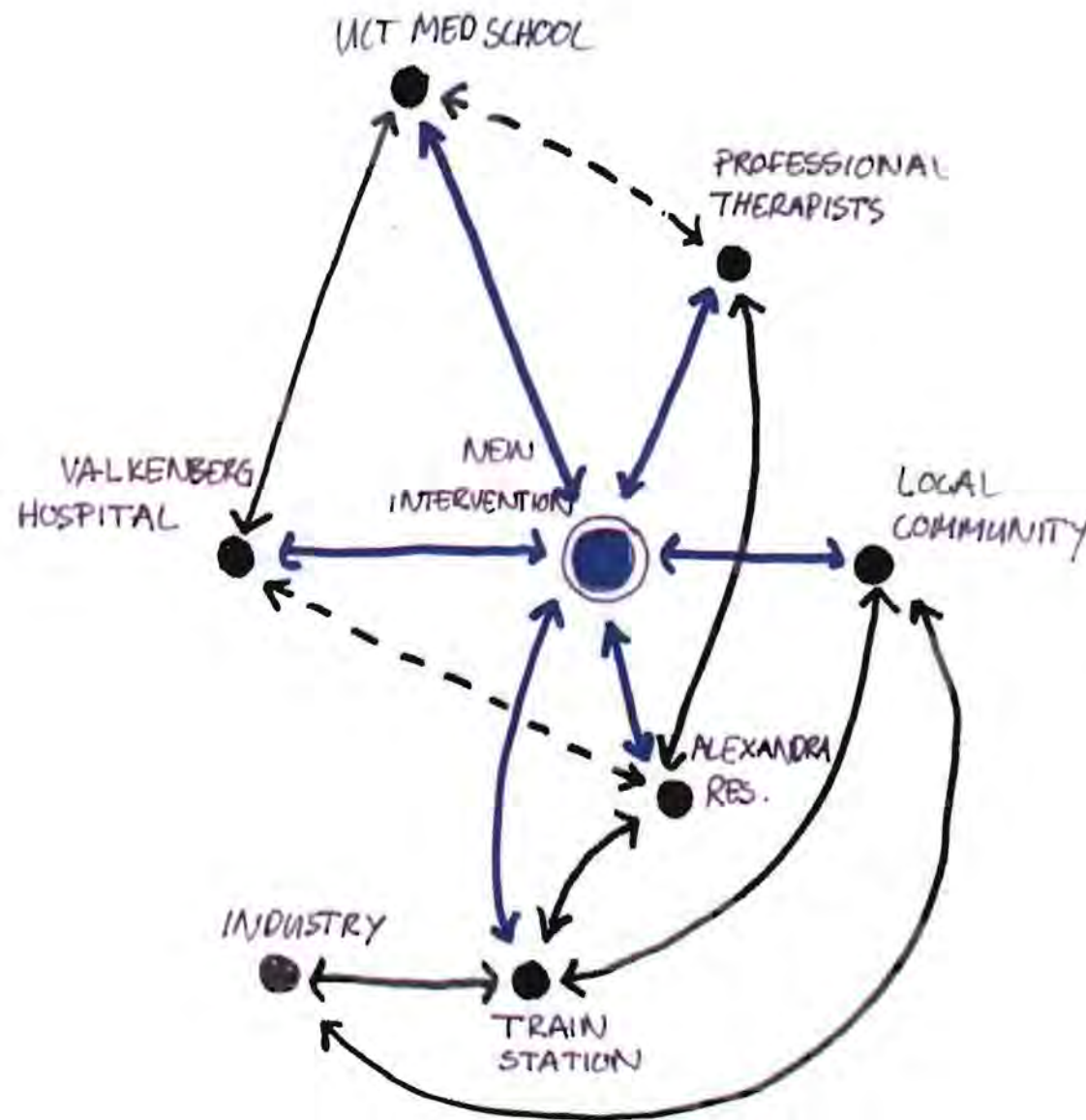
This was the first context model showing the raw idea that came straight out of the first design exercises.

SOCIAL PROGRAMME

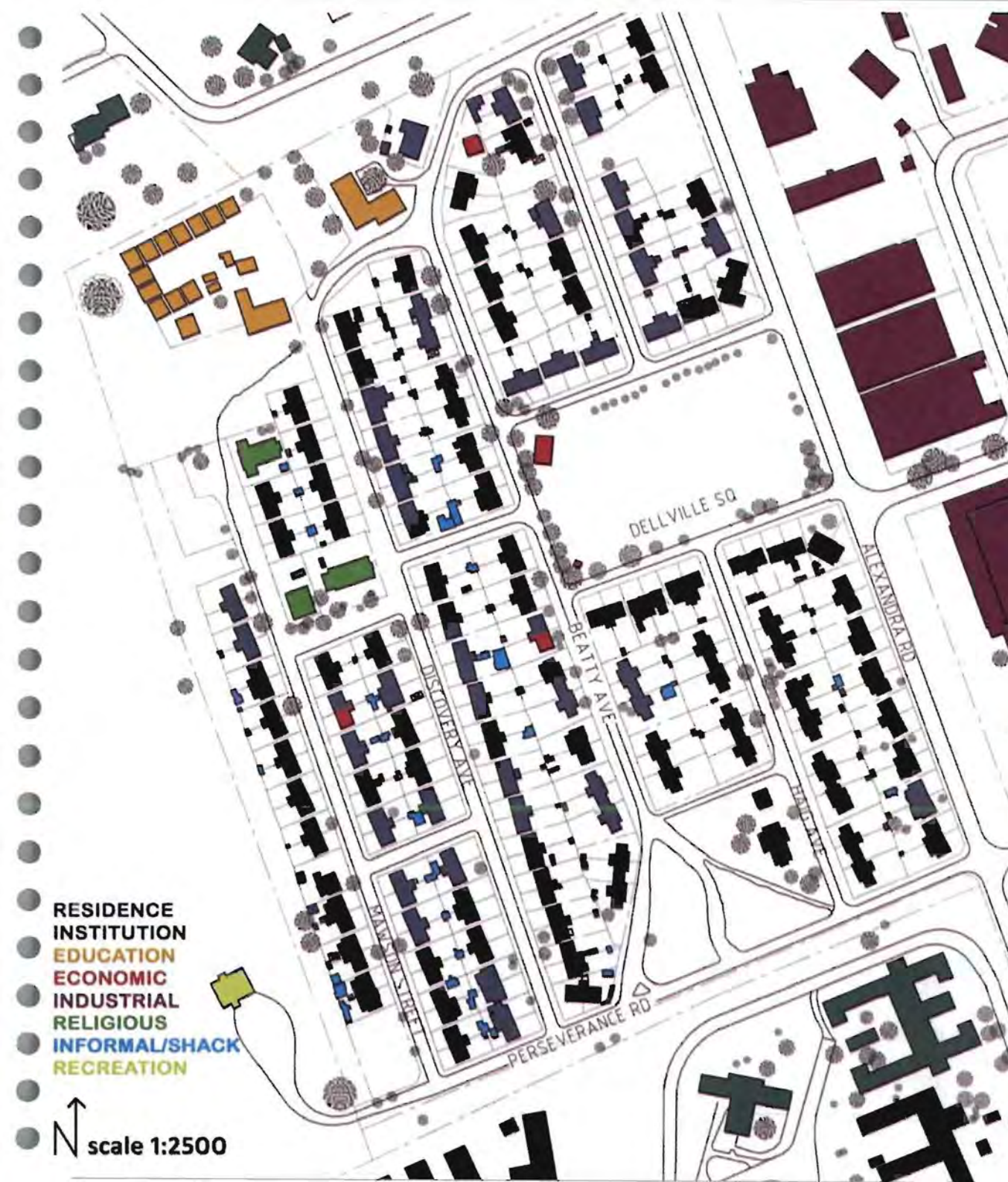
Site and Community Design Considerations

The programme of the intervention was derived from a combination of the thesis enquiry, the theoretical investigations and site explorations. It was only natural that the intervention should take on the form of a mental or physical health institute due to the neighbouring Valkenberg Psychiatric Hospital, Vincent Pallotti Hospital, Alexandra Rehabilitation Centre and also the long affiliated history of the site as a place of wellbeing. However, another psychiatric hospital in the area would in fact have been redundant. Instead I sought to propose a facility that would complement the surrounding institutions. The idea is to offer a form of therapy that is not available at the other hospitals so that a group of patients could visit the new facility not only to receive prescribed therapy but also to have an opportunity to engage with other people as well. Another reason is so that any private client could also utilize the services without having to sign up to a mental asylum, which unfortunately has a very negative connotation most of the time. People's misgivings of psychiatric institutions are often one of the reasons why many patients go untreated and do not seek much needed help. Therefore this facility would be an outpatient's establishment only. Given the theme of water and healing it would offer hydrotherapy in three different applications, namely: an aquatic therapy pool as a form of occupational therapy; thermotherapy pools as a form of psychiatric therapy; and a gym pool and underwater treadmills as a form of physical therapy. These ideas will be explained in more detail in the *Accommodation and Technical Requirements* section to follow.

The diagram on this page shows the intended connections of the new intervention with the neighbouring facilities. Another key benefactor of the facility should be the local community (Maitland Garden Village) adjacent to the site.



The intended connections of the new intervention with the neighbouring facilities.
[Author]



Maitland Garden Village was built and formulated in 1926. All houses belonged to the municipality and villagers were not allowed to purchase them. Traditionally, only coloured families were allowed to rent houses. There are 50 housing units, but unfortunately, most of the houses are overcrowded (about 25 - 30 people per house). A number of informal housing structures are situated in the backyards. At present the unemployment rate is high and most of the children and young adults are living lives without vision and meaning. Many adults abuse alcohol and other drugs and are therefore not actively guiding the youth. I find that this community could benefit greatly in a new development that would offer recreation, employment or education to the youth. This thesis aims to fulfil all these needs. It might sound ambitious, but I have found that these programmes tie in easily with the thesis concept and also the framework for the area as set up by the Two Rivers Urban Park.

Photos of the community [Taken by author on 6 February 2011]





This diagram was used as a design tool in the project. It shows the potential overlap in space and function of the water purification system and that of the other functioning spaces of the building. [Author]

Now given the programme of hydrotherapy, the building also offers healing in a more literal sense of the word. As mentioned before the building would draw polluted water from the river that would undergo a purification process and then the clean treated water would be used for the therapeutic pools and other recreational purposes in the building. This is not only done to utilise the water, but also stands as an example of environmental education. The building therefore becomes an exhibition of water conservation. The diagram on the left indicates the initial attempt at aiming to combine this mechanical and chemical process of water purification with that of the habitable rooms that forms the rest of the programme. You will notice that in the beginning I have included lecture halls, an auditorium and exhibition spaces. However through the process of refinement of the thesis and for the sake of clarity and simplicity I have abandoned these ideas and focussed more on the therapeutic spaces and the community facilities within the programme of the final design. I have included an in-depth explanation of the water purification process and its relative terms and concepts at the end of this document under the *Materiality and Making* section.

Accommodation and Technical Requirements

In order to design a space for therapeutic healing, it is necessary to know what the exact requirements are that could assist the specialist in optimising his/her work. Following the four spheres of healing mentioned before, the programme of the building deals specifically with three separate but related therapy departments and also a more public section that would include spaces that will serve the local community and general visitors etc. The therapy divisions are: occupational therapy, physiotherapy, and psychiatric therapy. Below follows an extensive account of the technical requirements of the different therapeutic treatment processes such as room sizes, pool sizes and equipment installations etc.

Occupational Therapy (OT)

This form of therapy is the careful rehabilitation of patients (more often called clients) with disabilities, mental/social disorders or physical injuries to assist in performing daily activities such as brushing teeth, tying shoe laces, or climbing stairs. In the aim of achieving this, an occupational therapist may use a number of different spaces or apparatus to evoke the desired emotion or physical strain in the client. Some of these requirements include the following:

A **multi-sensory room** is a non-threatening environment where people with disabilities can take part in stimulation of the primary senses. This form of therapy has proven to help clients overcome inhibitions, enhance self-esteem, and reduce tension. The concept was first developed in the 70's by two Dutch psychologists. Originally this form of therapy which they termed "snoezelen" (taken from the Dutch "snuffelen" (sniff / explore) and "doezelen" (doze / relax)) was primarily for people with learning disabilities, but was quickly adopted in rehabilitation for a variety of other physical- and mental disabilities. (MERTENS.2011)

A typical snoezelen room includes soft furnishings, image projector, fibre optic toys and carpets, bubble tubes and interactive sensory surfaces - all of which provide visual or tactile stimulation. The objective with the multi-sensory environment is to stimulate and rehabilitate the nervous system so that the client can ultimately process an increasing variety and complexity of information and thus function normally in everyday activities. To achieve the desired atmosphere, the room has no windows and is completely isolated and insulated from outside sounds that might distract the client. Most sensory rooms have a neutral white colour so that the preferred mood can be created by means of lights. This helps the client to control his/her own environment in a fun and interactive way. (PREMIER SOLUTIONS. 2010)

A **calming room** on the other hand is a space where the objective is not to stimulate, but to guide the client through a gentle process of mental escape. The client should ultimately leave the room relaxed and rejuvenated or should preferably even fall asleep during the therapy. In this therapy visual and audio tools are used to promote relaxation and contemplation. Another common apparatus is a waterbed that functions as a massaging mattress. Water is one of the best mediums for music and resonance and in the case of the waterbed the base is fitted with two resonators that plug





[11]



[12]



[11]

in like a single speaker to a (20 - 100 watt) stereo. Clients will then be able to 'feel' the music while the bed moulds itself to the shape of the body giving support without any pressure points. It also includes variable heat control for maximum comfort to the client. (SENSORY PROCESSING DISORDER. 2011) The calming room must be programmed so that light and sound effects reflecting off the walls and ceiling gently blend into one another so that it is barely perceivable. (PREMIER SOLUTIONS. 2010)

What is required in both the sensory room and the calming room is a one-way viewing panel so that a therapist can see if a client needs assistance without disturbing the therapeutic process. In addition both rooms should be fully laid-out with soft padding on the floors and walls to protect clients from hurting themselves. A special "high density foam" is required with floor pads 50mm thick and wall pads 60mm. All padding must be covered with hard wearing and easy to clean Vinyl. (PREMIER SOLUTIONS. 2010)

But what is most important in the occupational therapy section is the **aquatic therapy pool**. This usually takes on the form of a heated pool that is custom-designed to suit the therapeutic needs of a person with impairments due to illness, injury, disease, or intellectual handicap. These pools typically have a ramp or a hoist that can assist clients in getting into the water. The pool can take on any shape and usually includes steps at the floor under the water and grab rails on the side that therapists may use to test certain physical abilities of the client. In a sense the pool is an obstacle course, submersed under water to ease the strain on the client's muscles.

The desired temperature of such a pool ranges between 32-37 degrees Celsius depending on the needs of the user. Because of the high pool temperature, the plant and equipment will be designed to produce a minimum water turnover of one hour. In the design project this water is then pumped back into the water purification system where it can be treated and then reused as clean water. The depth of the pool is also depended on the specialist's requirements and may range from 1m to 1.5m so that users can walk on the flat bottomed, stepped or sloped floor. Ideally the pool should offer a wide range of different obstacles. (PINELOG. 2011)

Similar to the snoezelen room, the aquatic therapy pool can be combined with an interactive multi-sensory light and sound system that reflects onto the water surface so that clients can experience the same therapeutic treatments with the added sensation of weightlessness in the water. (PREMIER SOLUTIONS. 2010) The pool room should include a **plant room** and **chemical storage** area that is easily accessible but secured.

Integrated with the pool room will be a general open yet private **wet area** that will house the ablutions, including toilets and showers for the clients that use the pools. The flow of this area should ease the therapist in assisting a client or allow enough privacy and support so that those who are able can help themselves.

The OT section of the facility should house a spacious and friendly **reception area** and **office space** for therapists that are separate to the main activities of the therapy rooms.

Examples of a snoezelen room, aquatic therapy pools and a waterbed as used by occupational therapist globally.

Psychiatric Therapy

Although psychiatric therapy can take on a number of different forms, this project will only accommodate a form of hydrotherapy specifically designed for patients with mental disorders. For the purposes of this thesis, we will refer to this as **thermotherapy** as explained previously in this report.

This branch of the facility will include the following areas:

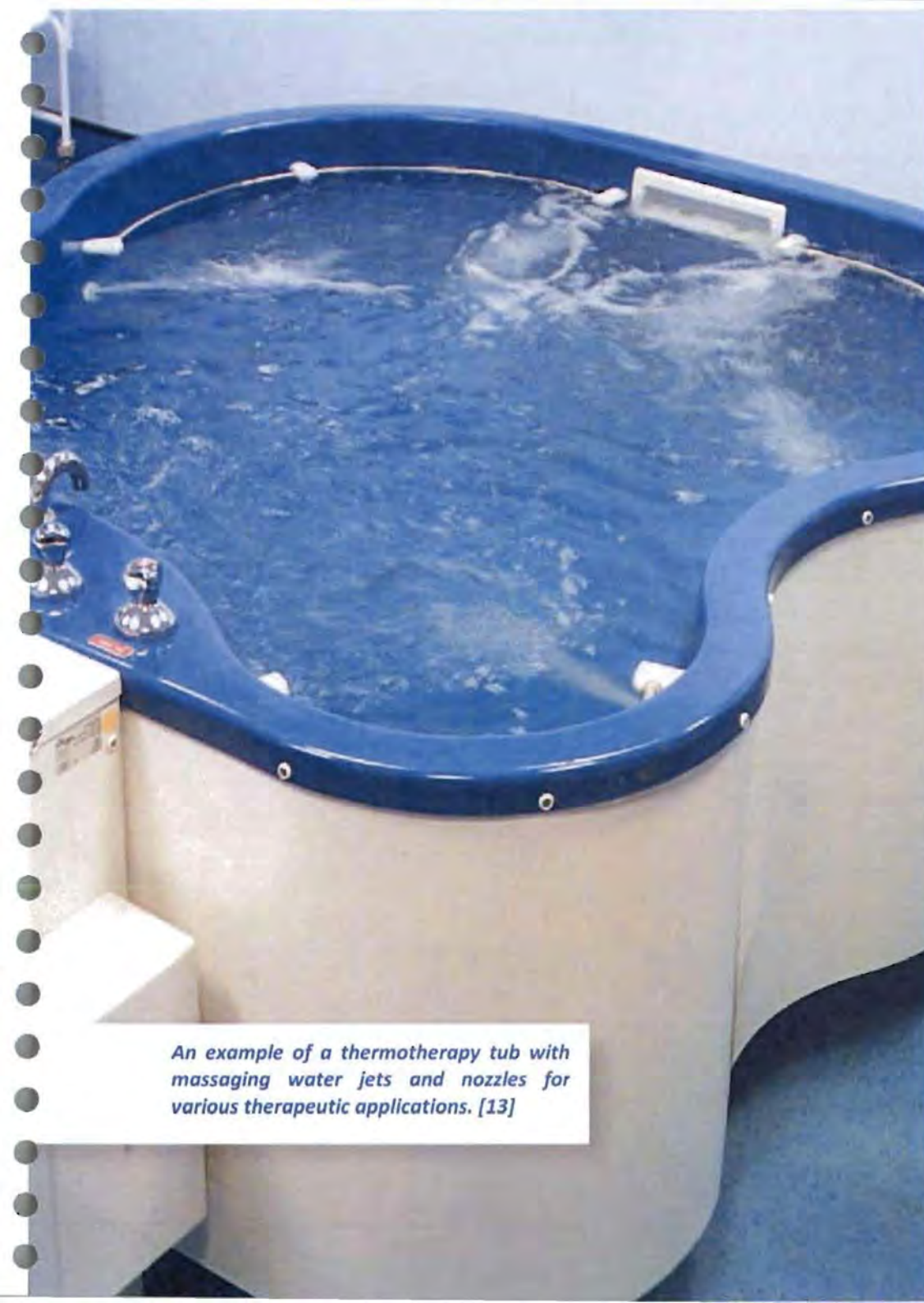
A friendly, welcoming **reception** area closely situated to the main entrance of the building but visually separated from the main flow of the public section. The reception should have a low ceiling of no more than 3m and should be as homely as possible with a small library, soft flooring and a view out to the mountain. Next to the receptionist office should be a **small meeting room** and **kitchenette** for staff and a small storage area.

The unisex wheelchair accessible **change rooms** should be easy to get to from all areas of the psychiatric division. The reason why all ablutions for the disabled in this facility should be unisex is that more often than not a client or patient requires the assistance of his/her caretaker who may very well be of the opposite sex.

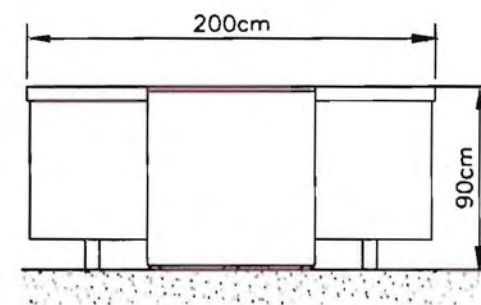
There should be a minimum of 2-3 **psychiatrists' of psychologists offices** that include enough room to accommodate a single sofa and two comfortable chairs apart from the desk space. Preferably a medium size **group therapy room** should also be included.

Lastly the **thermotherapy pool room** should be furthest away from the public waiting area so that visitors cannot walk into this private section without the assistance of a staff member. These pools allow the therapeutic process to make use of the difference in extreme temperatures. In the Advance Theory Research Report I have given a short account on the negative history of this form of therapy as it was abused by some (not all) medical staff in the mental asylums of the early 20th century. It is important to note that today there exists a far more positive understanding of the value of this branch of hydrotherapy and psychiatric patients today enjoy more rights in terms of giving consent to the forms of therapy they get exposed to. At no point will any patient be forced to endure any form of therapy that makes him/her uncomfortable. Also important to note is that while some patients in the 1920's had to suffer hydrotherapy as a form of torture, many other patients reacted well to the therapy and even requested it from their doctors and nurses.

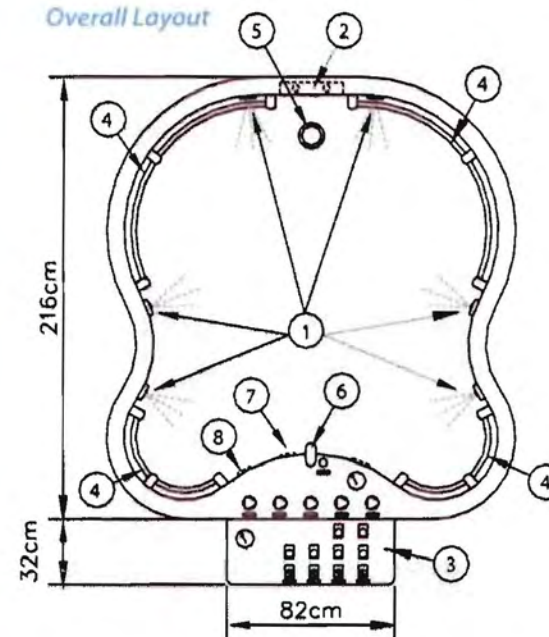
In short the principles of this form of therapy work like this: hot continuous baths are usually prescribed to patients suffering from conditions such as insomnia, hyperactive behaviour or any suicidal attempts. The steam would allow them to relax and eventually fall asleep. Some treatments can last from a few hours or even stretch over several days. Cold water on the other hand is commonly used for the opposite effect on patients suffering from manic-depressive psychoses and similar illnesses. Cold water allows the blood flow to the brain to slow down and thus decreases the person's mental and physical activity resulting in a state of calmness.



An example of a thermotherapy tub with massaging water jets and nozzles for various therapeutic applications. [13]

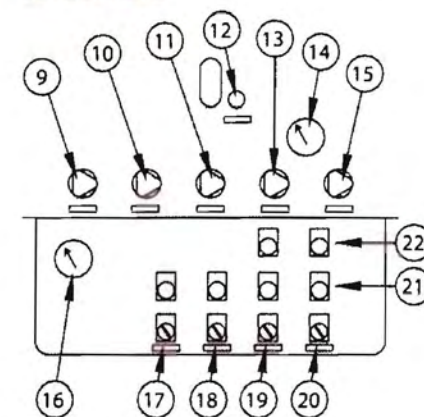


Overall Layout



1. Six nozzles located at 15cm under the water level
2. Skimmer
3. Control panel
4. Handrails in stainless steel
5. Draining plug
6. Filling nozzle
7. Aspiration grid
8. Lance pump
9. Hot water tap
10. Cold water tap
11. Fill tap

Control Panel



12. Air control for whirlpool
13. Tap for cleaning shower
14. 0-10 bars manometer for massage lance
15. Adjustable pressure control
16. 0-4 bars filtering pressure gauge
17. «On/Off» for filtering pump
18. «On/Off» for chloration pump
19. «On/Off» for heater
20. «On/Off» for pump
21. «In service» luminous indicators
22. «Defect» luminous indicators

Physical Therapy

This division would house some of the more public therapeutic amenities and is divided into two sections: the fitness centre and the physiotherapy rooms.

The fitness centre will comprise of a swimming area with a **25m gym pool, hot baths and sauna**, aerobics or martial arts **studios** and an all-inclusive **fitness gym**. This means that all exercise machines are accessible for disabled people as well as able bodies. The calculation of the total area and capacity of the fitness gym should be based upon a floor area of 5m² per piece of equipment. The optimum ceiling height should be between 3.5-4m and should not be lower than 2.7m. In addition access control into the gym is necessary for the protection of children and other special needs visitors. However the **reception foyer** should be warm and welcoming and include a small **juice bar** and a big enough service area for the distribution of towels etc. A **staff room** and a secure **manager's office** are also required including a **first aid room** combined with a small private assessment room that would contain weighing scales, a height gauge and heart rate monitoring equipment etc. (SPORT ENGLAND, 2008)

The **ablutions** must also be wheelchair friendly and must allow for 1 changing space for every 25m² fitness area and 1 shower for every 6 changing spaces. It should include an adequate amount of toilets, vanity tops and lockers. (SPORT ENGLAND, 2008)

Some of the other services would have to include **storage** and a **maintenance room** for the fixing of broken equipment, and a **plant room** for the swimming pool pumps and machinery. A goods delivery loading area big enough for fitness equipment should also be included and a small **laundry** for the washing of towels etc.

The Physiotherapy section will share much of the main fitness centre services but will include private **physiotherapist's consultation rooms** and offices. True to the nature of the project, it might include underwater treadmills and other more specialised apparatus used for the treatment of physical injuries by the means of water therapy.



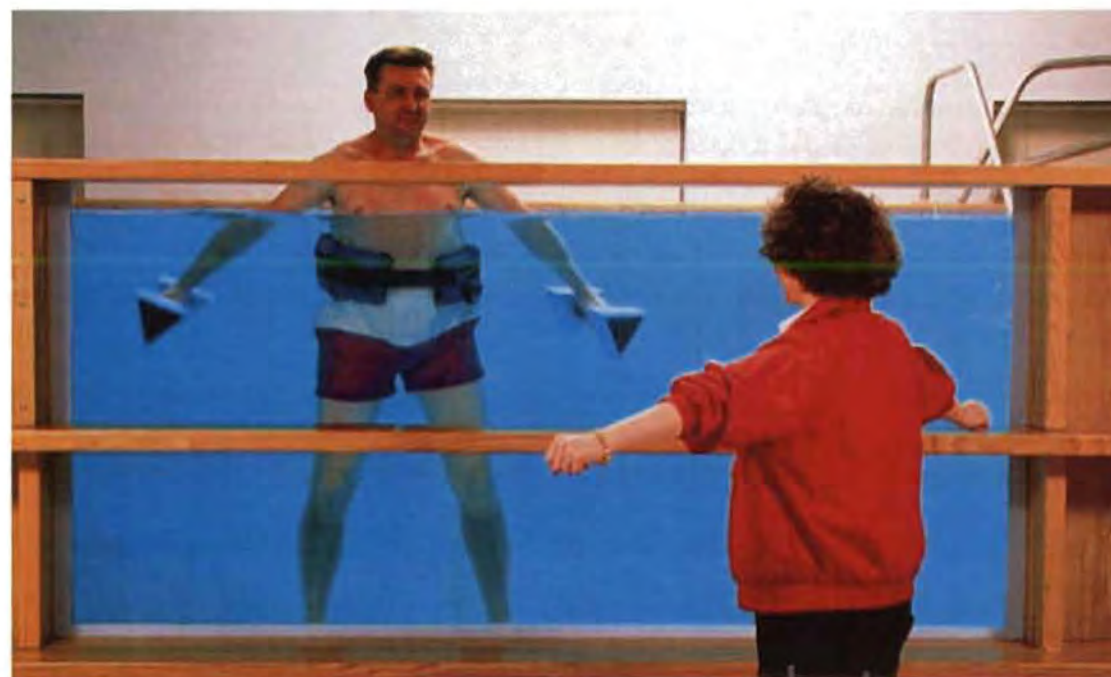
Left-top: Massaging water jets in the Hydrotherapy pool. [14]



Left-bottom: An example of an underwater treadmill. [15]

Right-top: Inclusive gym equipment that is wheelchair-friendly. [16]

Right-bottom: Man exercising with weights in hydrotherapy pool. [17]



Community Spaces

As explained under the *Site and Community Requirements* section of this paper the surrounding community of Maitland Garden Village is a poor community with a high unemployment rate and an even higher rate of alcohol abuse. The neighbourhood can benefit greatly if there would be a safe place of gathering, relaxation or even skills training nearby. Taking this into consideration, I have included the following in the layout of the facility that would easily tie into the rest of the programme:

As part of the need for environmental education that came out of the site framework the facility would allow the public to enter the water treatment section of the building where a specialist would take a group of visitors on a guided tour through the waterworks. This will be accommodated by viewing platforms and walkways that cross over the water tanks and filters in order to see the system from start to finish. Here the guide would explain the process in how the water is pumped from the polluted river, through the treatment process, to the end where the clean water is used in the therapeutic pools and for drinking. The objective is that this **visitor's centre** would contribute in promoting sustainable water-use in South Africa. It naturally requires a **reception area** and a small **seminar room** where a short movie or presentation of the process can be screened. It is also desirable that such a programme requires a social space that could take on the form of a small lounge or even a coffee shop with views out to the wetlands or mountain.

A **gathering room** that can be used for a number of different functions either by the community or by the staff members of the different departments of the facility or even a larger group of patients for any therapeutic purposes or group activities the therapist might formulate.

Then I have included **art workshops** that initially formed part of the occupational therapy department for the purposes of group art therapy. The aim is that a group of residents from the neighbouring Alexandra Rehab Centre or Valkenberg Hospital could use the workshops once or twice a week under the care and supervision of qualified occupational therapists and caregivers. However these workshops could play a vital role in setting a platform for integration between 'mental patient' or 'disabled person' and the general public if these art sessions were open to the community and other visitors as well. It would then even be possible to allow patients or the community to make and sell their artwork for pocket money.

The other need that came out of the site framework is **urban agriculture**. By renting a small piece of land any person from the community is free to plant vegetables or flowers etc. in his/her garden as a means of small income. This service to the community would require a communal **green house**, a series of **tool sheds** with smaller storerooms that can be rented out, undercover yet open **wet areas** with worktops and sinks, and of course a small **reception office** and possibly a small **living unit** for a residing grounds manager or caretaker.



An example of urban agriculture at the Gary Comer Youth Center design by Hoerr Schaudt Landscape Architects [18]



An example of a small greenhouse. [19]

INITIAL DESIGN EXPLORATIONS

This next section will explain the first design attempts, how the form of the building was shaped and how it has changed prior to the final design. I will briefly describe what I have learned through every phase of the design process and will explain the design decisions that have led to the unfolding of the project.

Phase 1: The Shape

Considering the large piece of land, I knew in the starting stages of the design that an intervention on this particular site calls for an iconic structure that is striking yet sensitive to its surroundings. I have chosen to explore a very abstract route to setting up helpful design parameters for myself. This avenue has led me to surprisingly exciting possibilities for what this building could be.

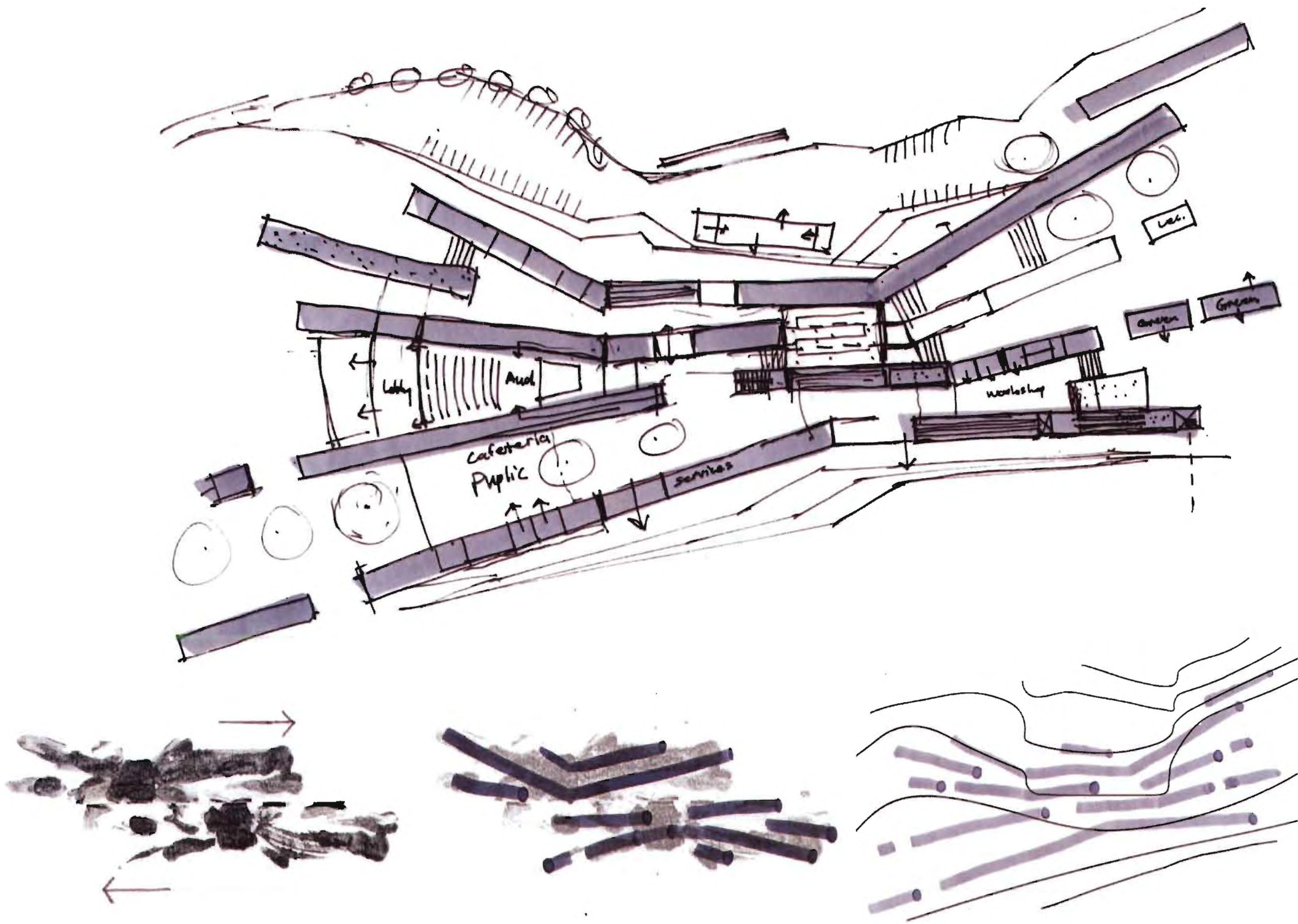
It started with a curious interest in meaningful shapes that came out of the thesis enquiry of psychology. The Rorschach test is a method used in psychoanalysis, in which a standard set of bilaterally symmetrical inkblots of different shapes and colours is presented one by one to the subject. The patient's perceptions are recorded and then analysed using psychological interpretation and complex scientifically derived algorithms. (GACANO AND MELOY. 1994) Typically there are ten standard flash cards that are used. (SEE PICTURE ON THE RIGHT)

I have made my own series of 'inkblots' as a device of arriving at the form. The bottom sketches on this page show the sequence from left to right of how an abstract form inspired by the Rorschach Test was superimposed onto the site and altered according to the site contours, resulting with the shape of a 'building' that runs parallel to the river edge. Then I started to imagine how these shapes could become habitable spaces as seen in the big sketch on the right and the following pages.



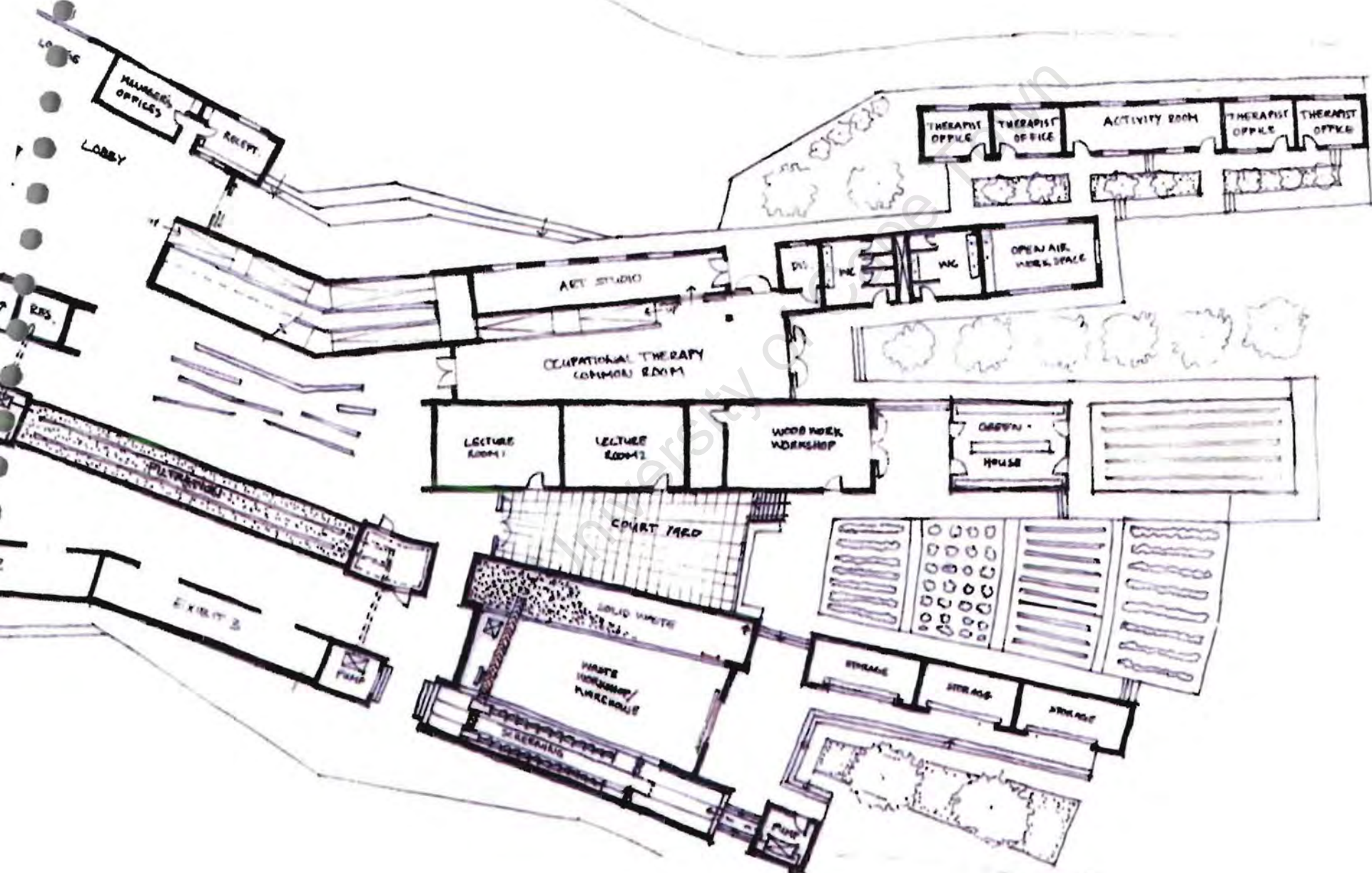
The ten images of the Rorschach Test. [20]



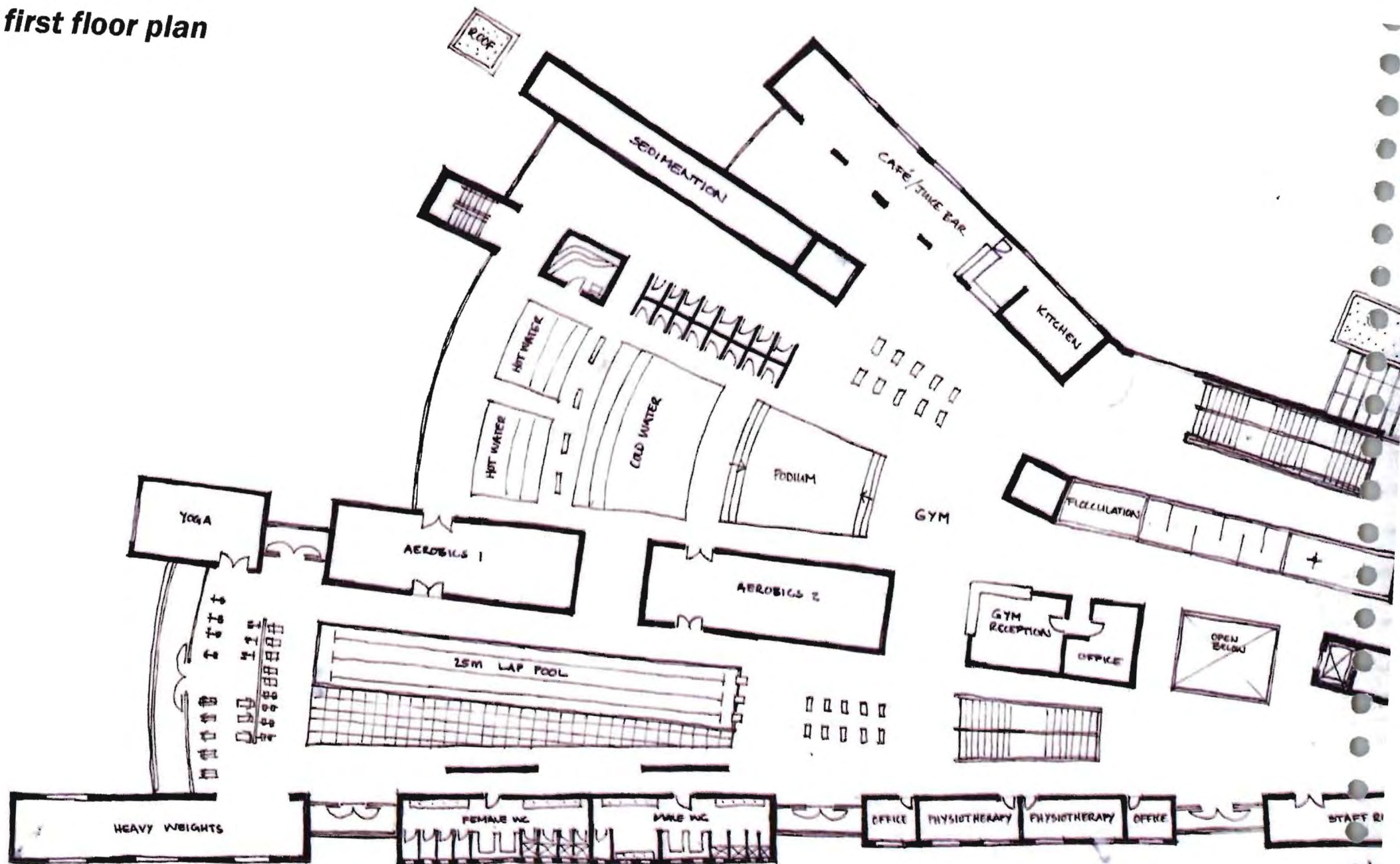


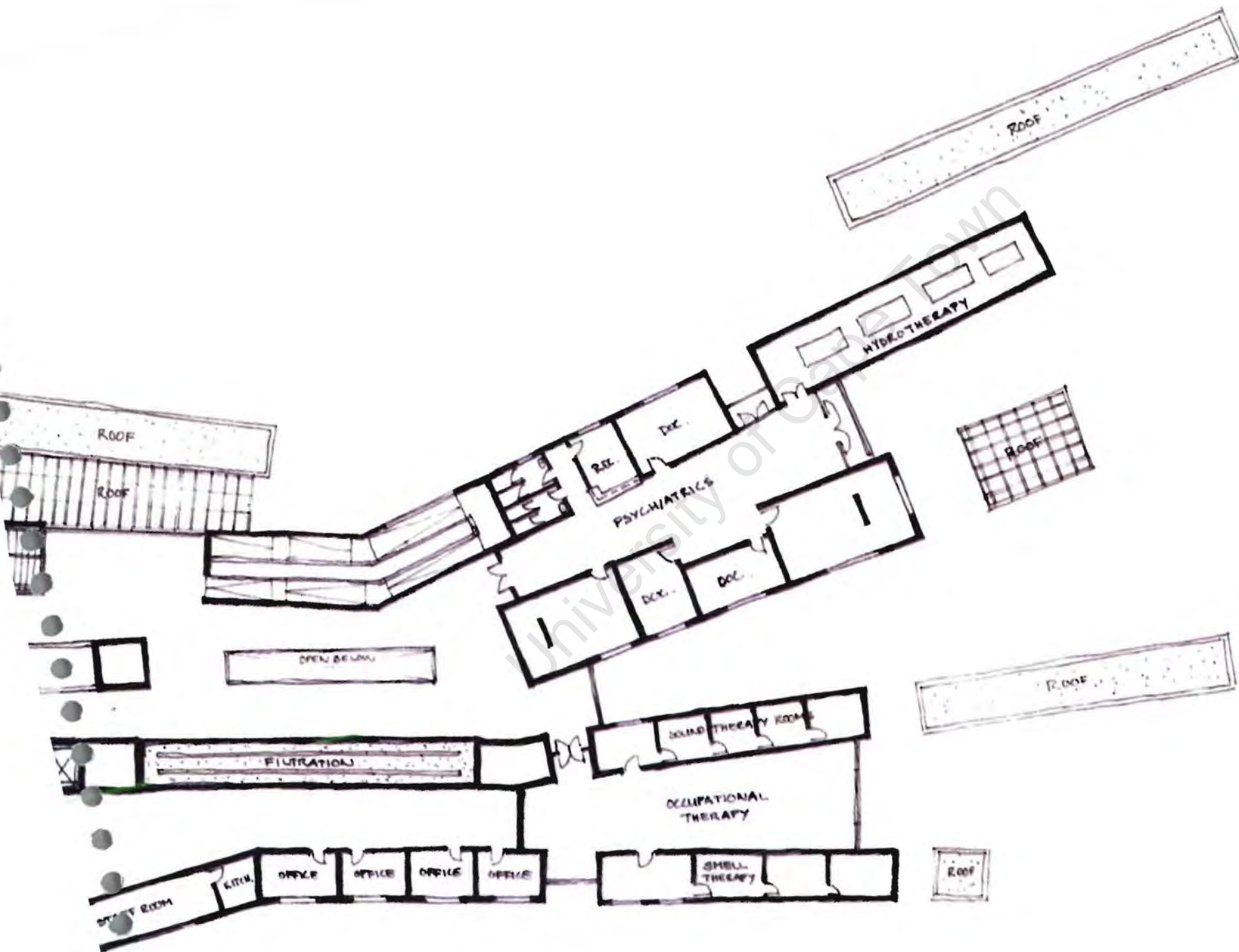
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//Initial design explorations



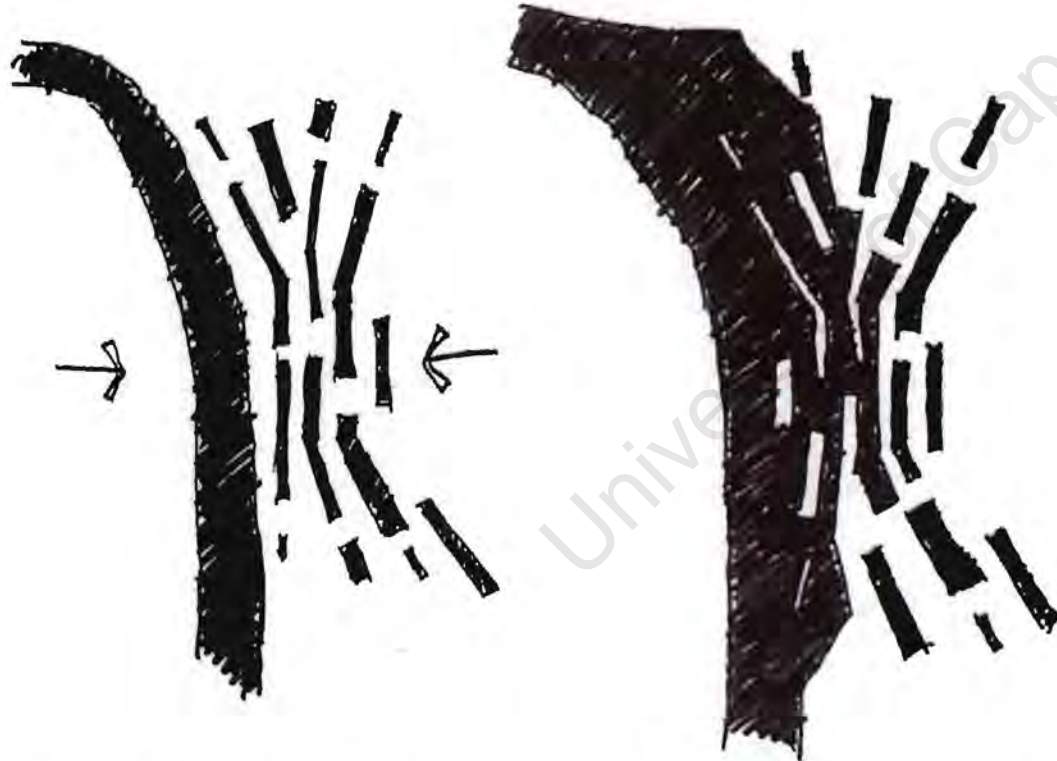
first floor plan





Phase 2: Flooding the building

Even though the first phase gave the design a giant start, I was not satisfied with the fact that the building was next to the river but did not really interact with it. I wanted the building to fit naturally in its surroundings and I wanted the river and its fluctuating floodplains to play an active role in the architecture of the facility. The answer to this once again came from a simple diagram that could easily describe a strong design-intent. By 'shoving' the river and the building together I could force the building to engage with the river as it would literally become flooded. This option allowed me to explore floating structures for a brief while. However, the design soon became over-complicated and lost the intended poetic simplicity. What's more is that the structure became so colossal due to the wide-ranging programme and soon the biggest challenge was to narrow it down and simplify the design.



river and structure parallel

river and structure integrated

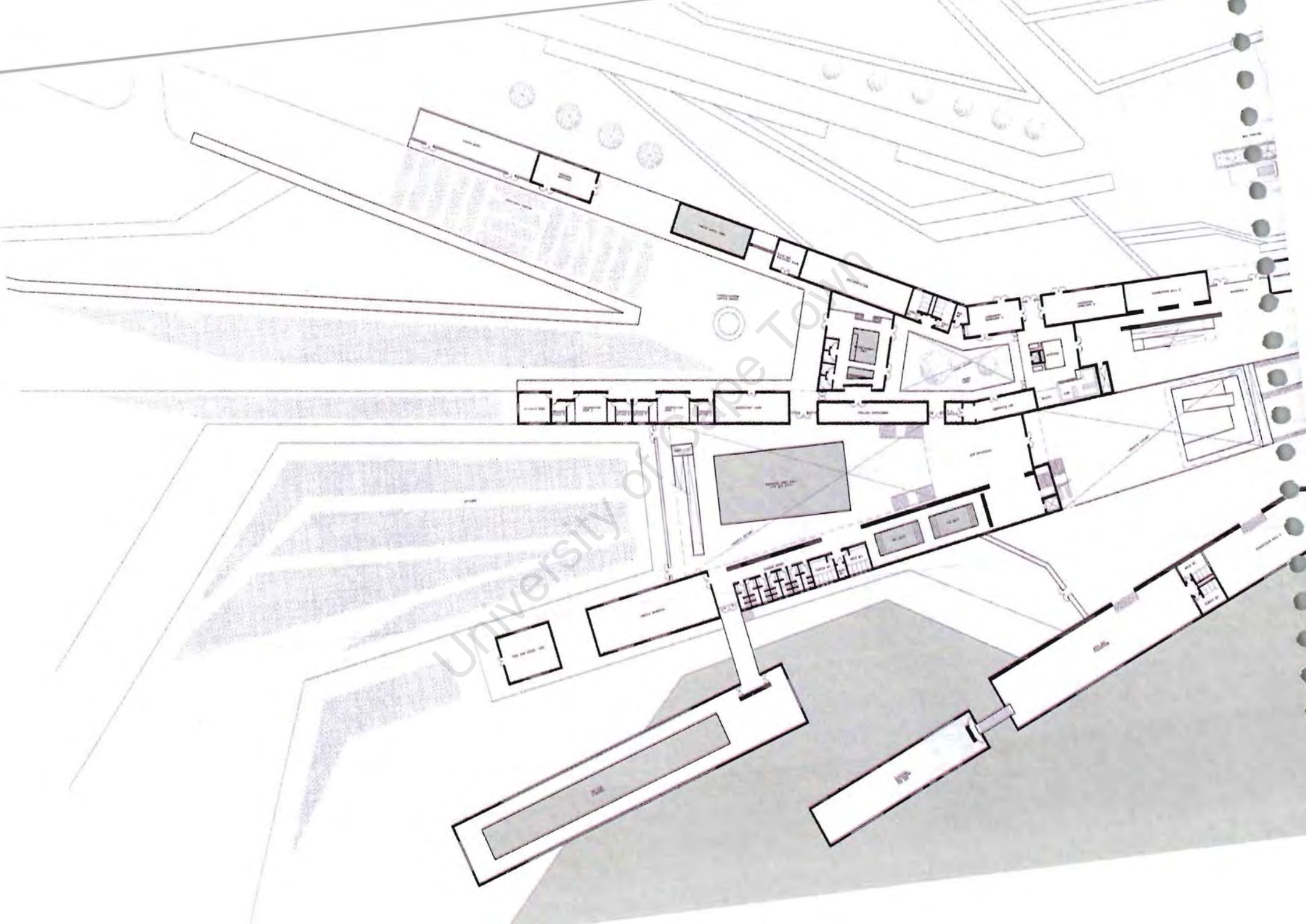
Summer dry condition.

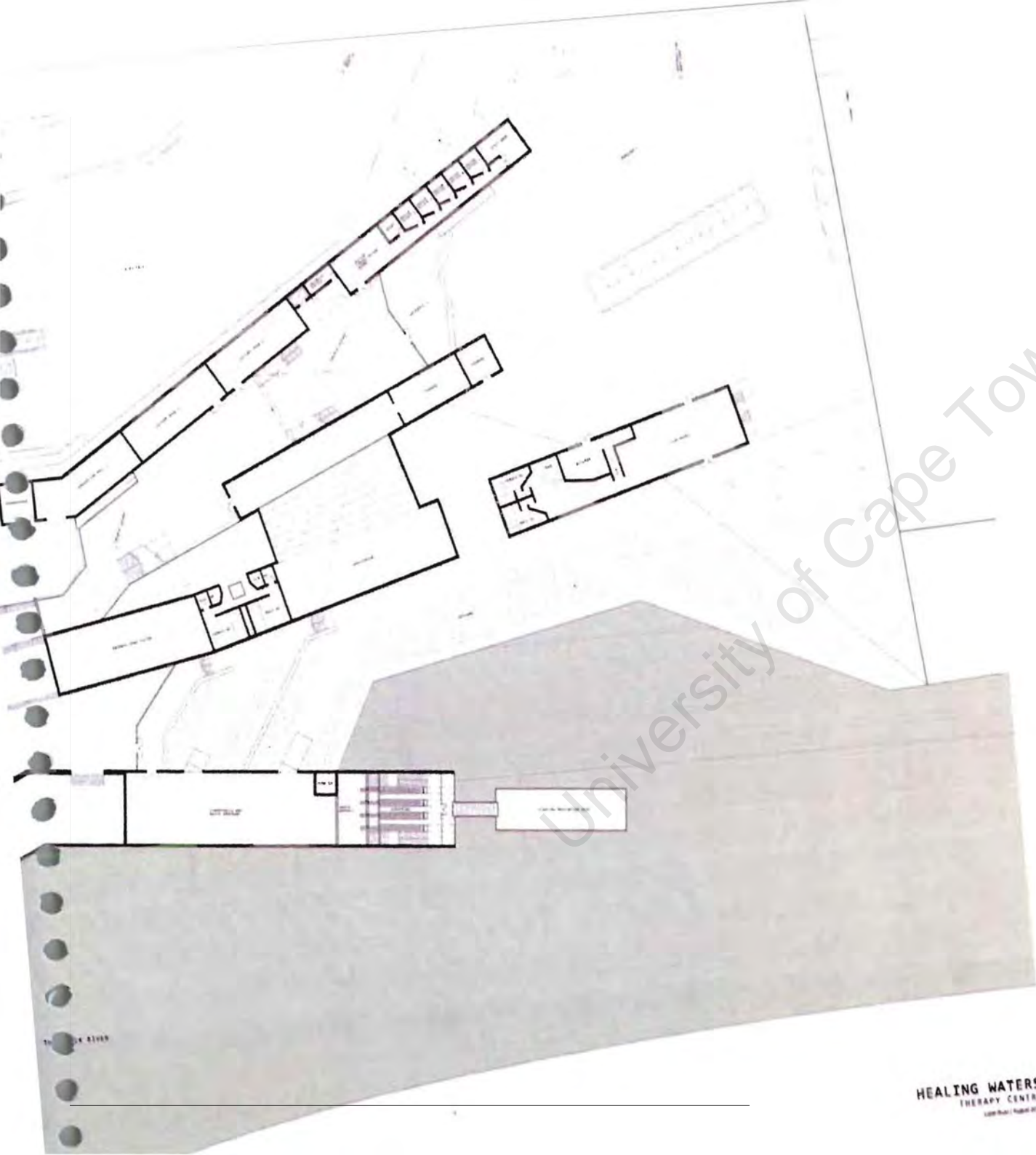


//Initial design explorations

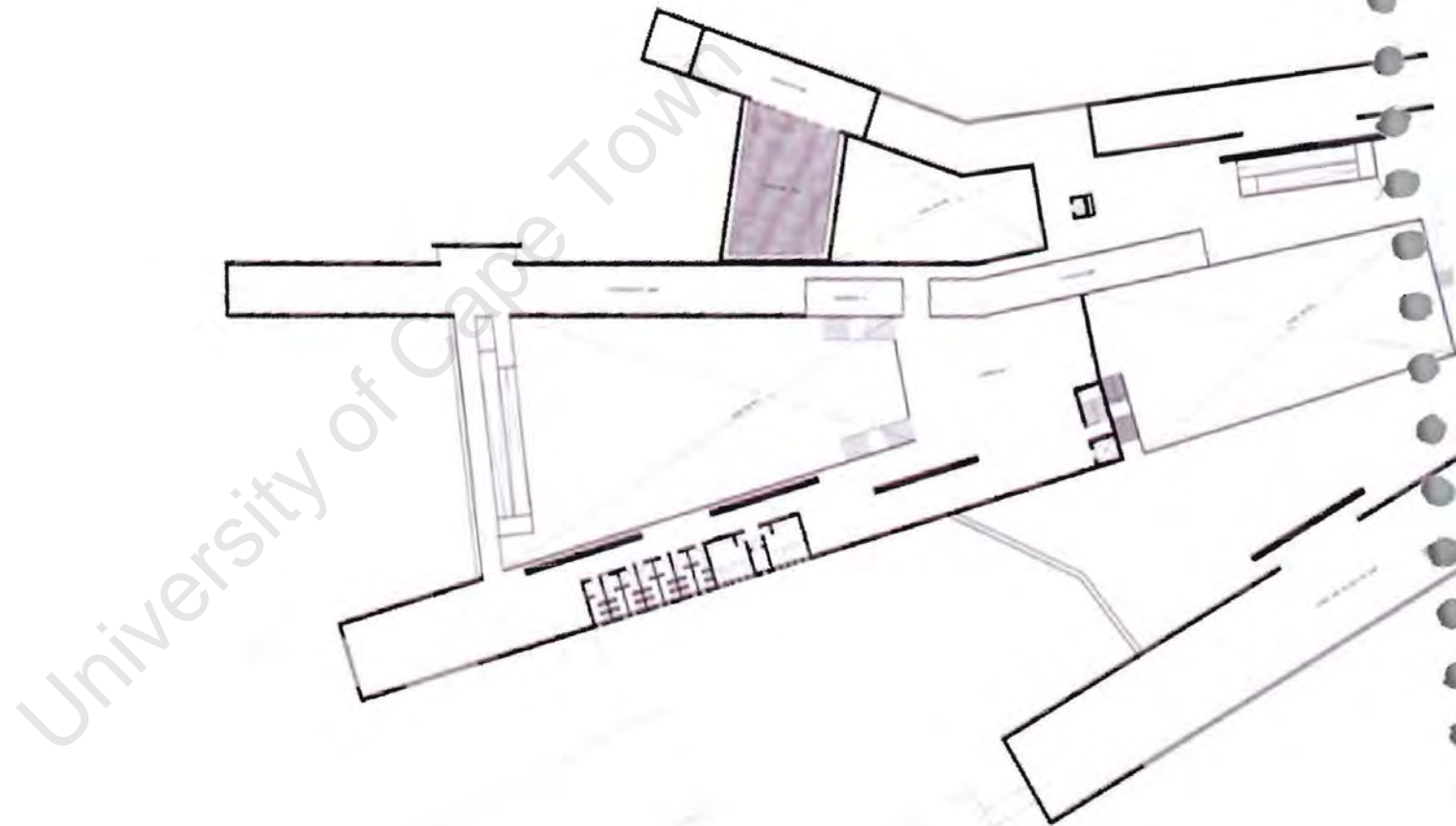
Winter flood condition.

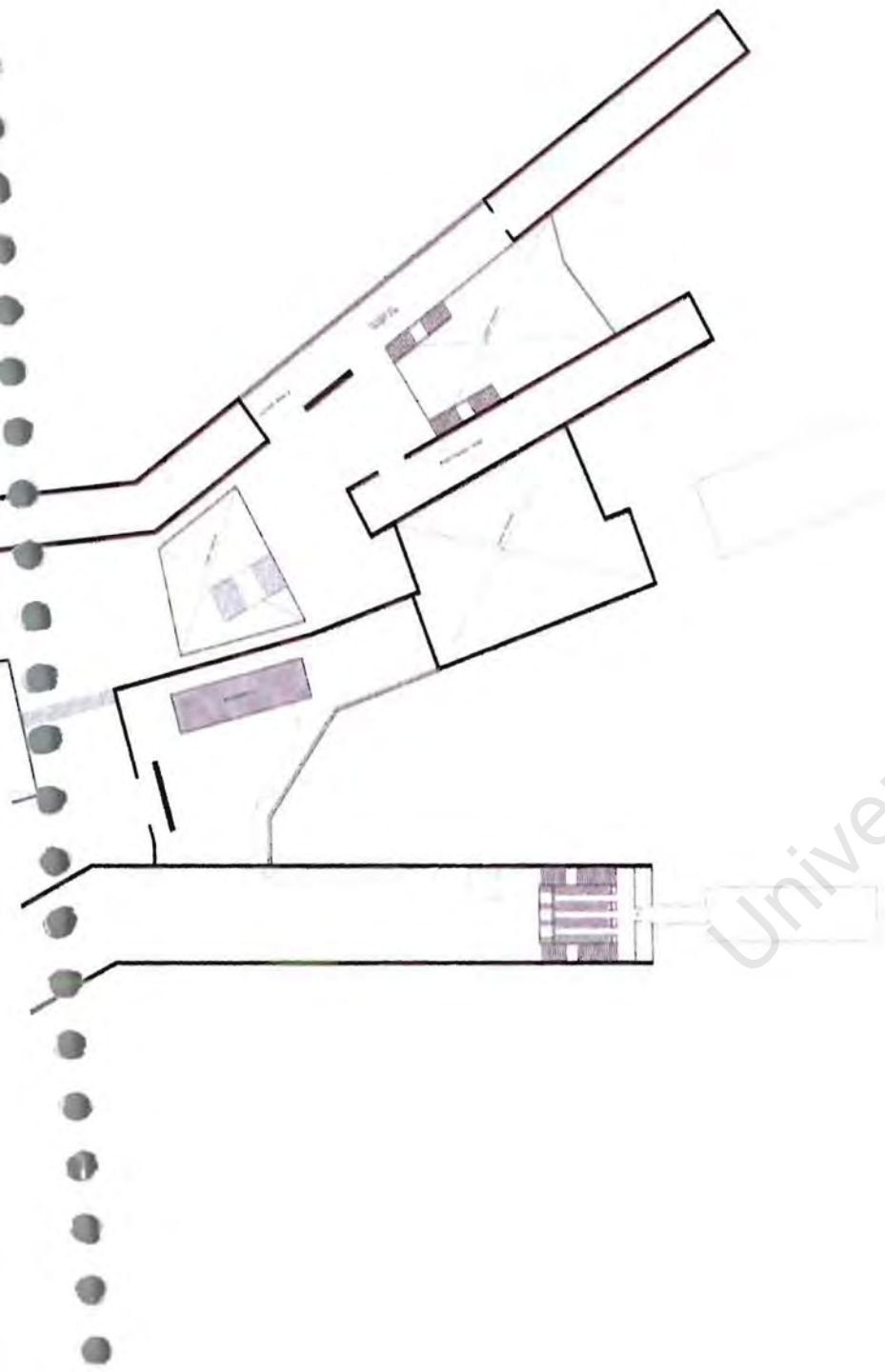




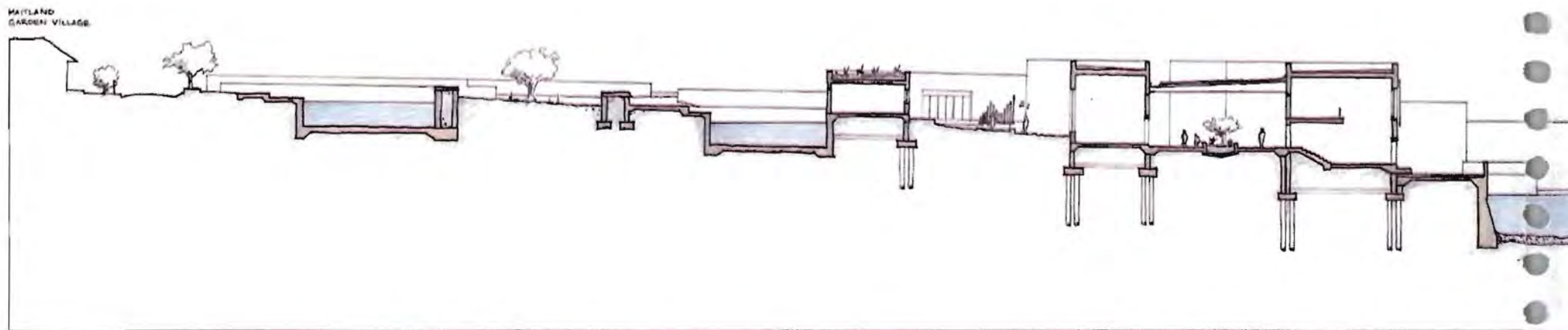


//Initial design explorations

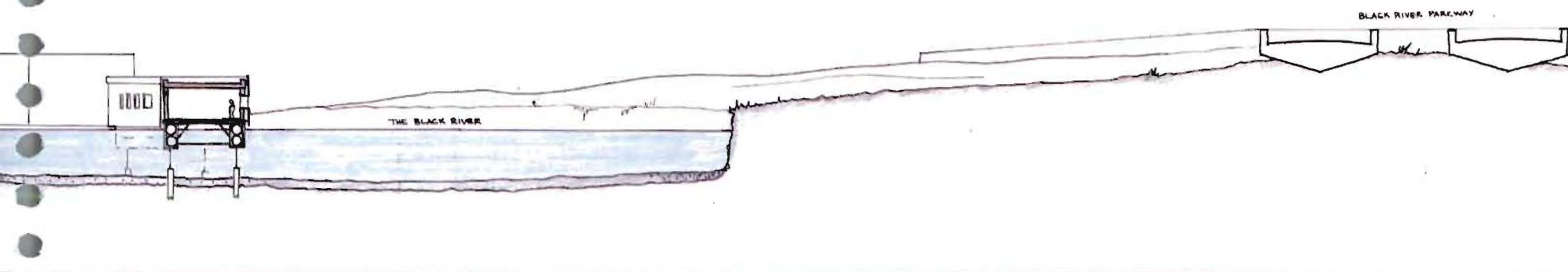




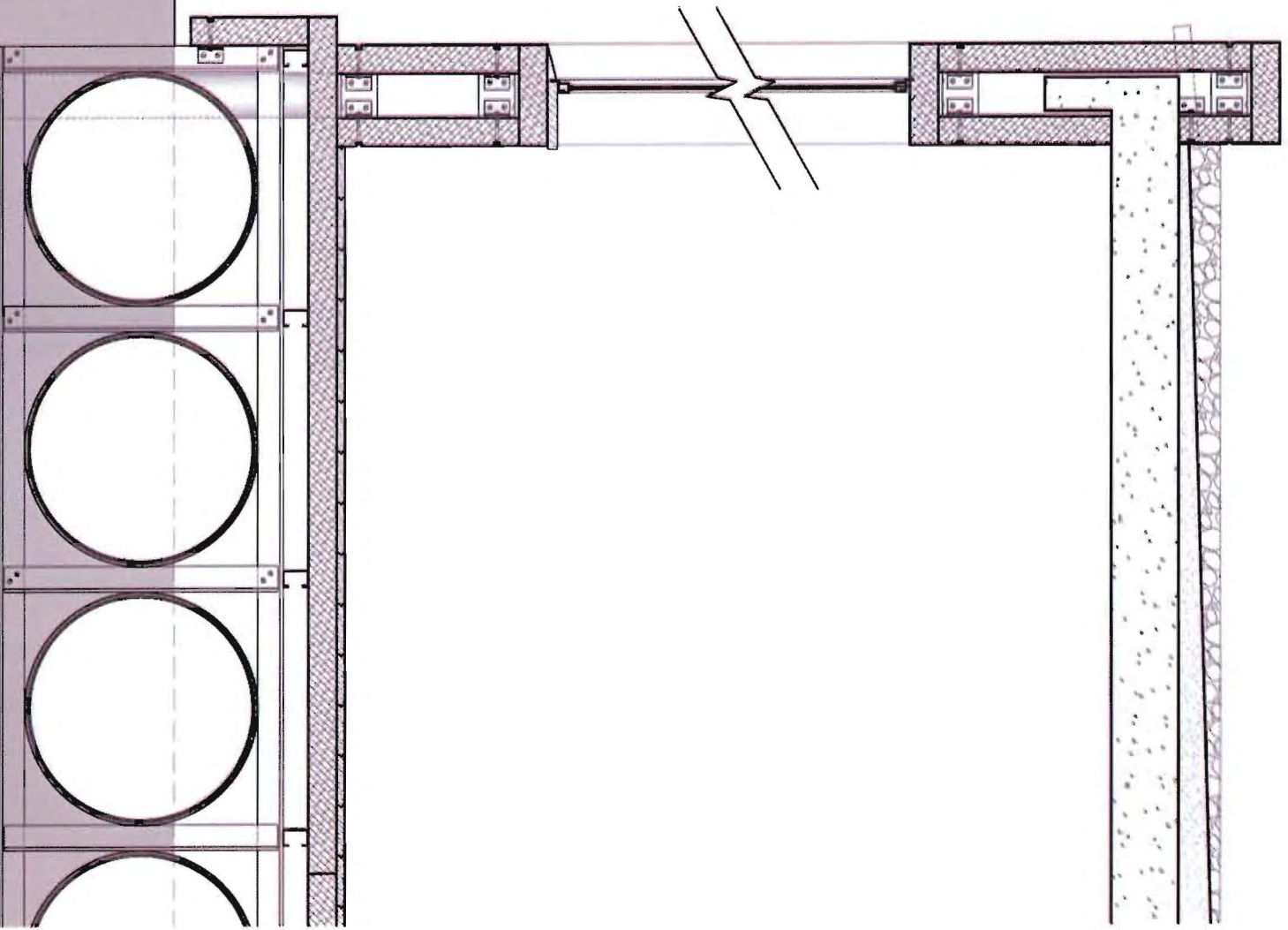
University of Cape Town



A cross-section cutting through the whole site shows how the building runs into the river and how the floating structures are situated over the water.



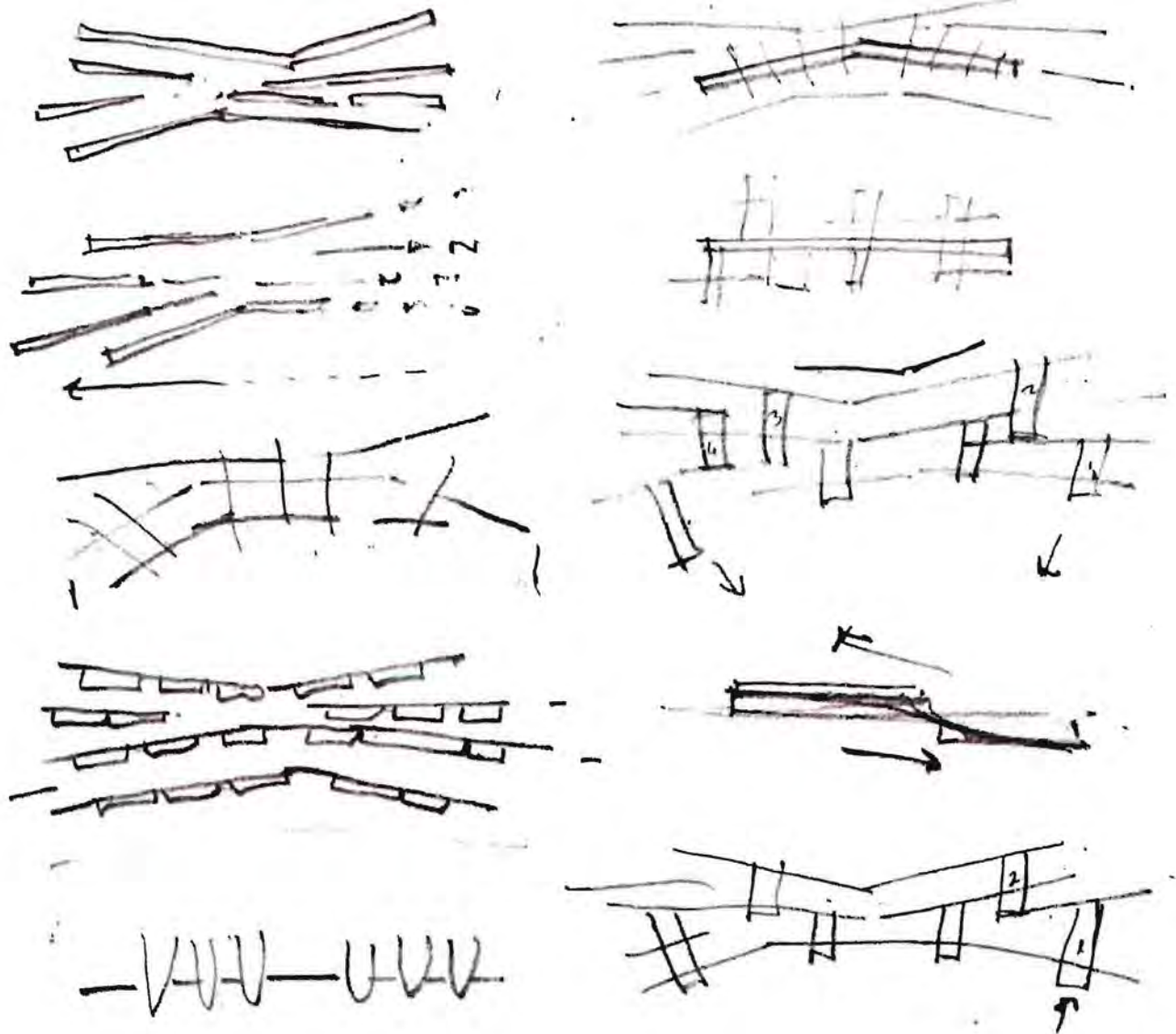
This detail section shows the structure floating on a raft of big air-tight drums keeping the building above the water. If the water level of the river rises, the structure would simply rise with it connecting to the grounded structure via flexible crossing bridges. The material used for the floors and walls is a fully waterproof (and structural) German composite material called Rexwall. It is compressed from recycled foam.

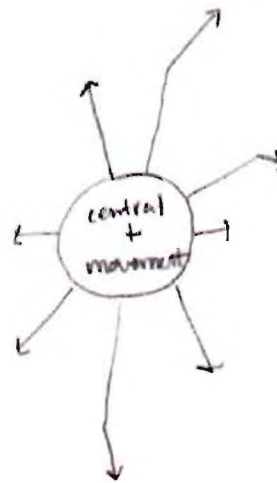
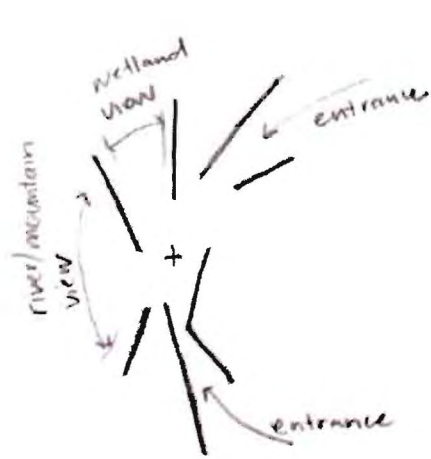


FLOATING BUILDING
SECTION THROUGH SIDEWALL scale 1:20

Phase 3: Redefining the idea

In the effort of trying to simplify the building it was needed to return to the original intent of the design. This process led me through a series of different design explorations. The following pages show just a few of these self-explanatory explorations.

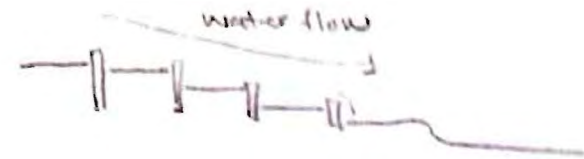
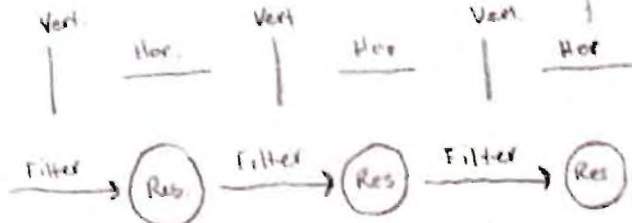
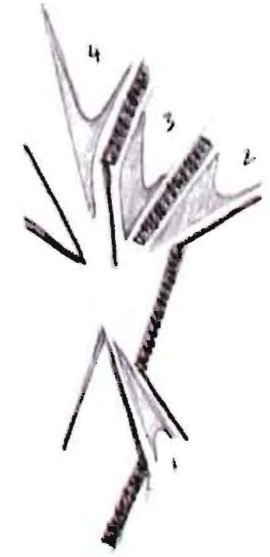
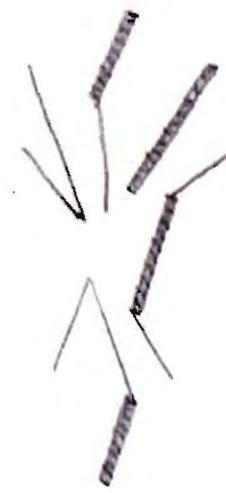


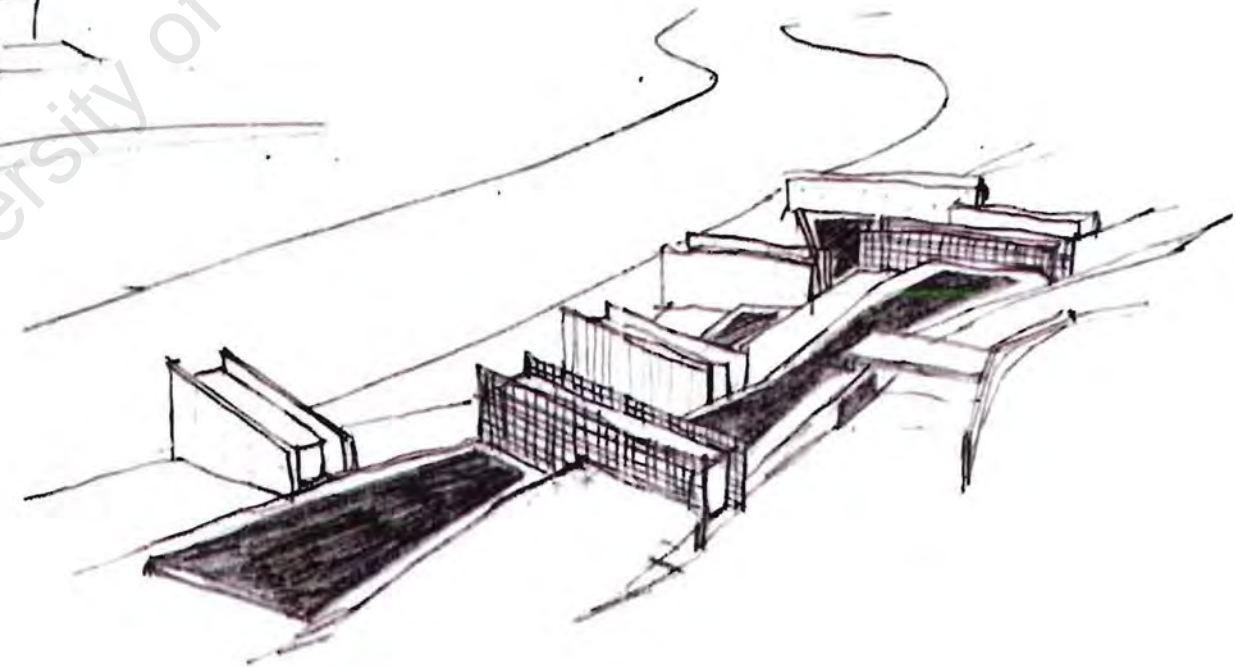
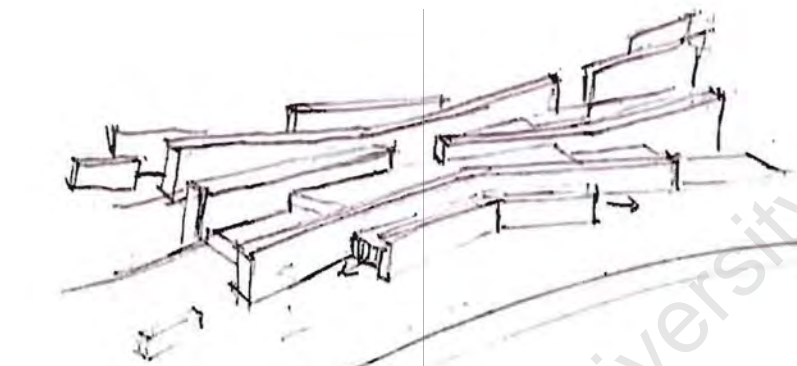
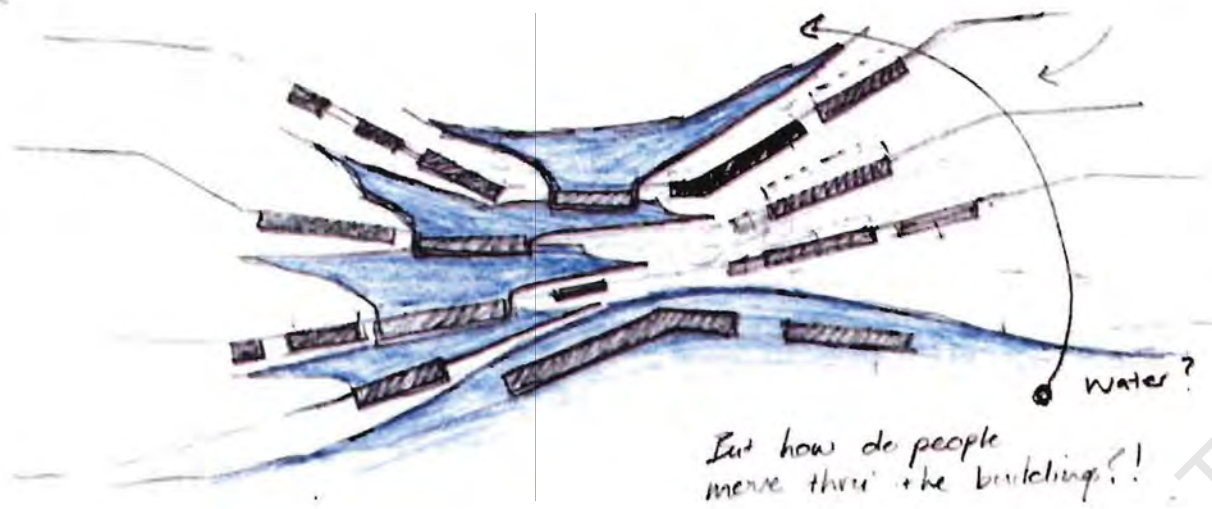


Socio-fugal



Socio-petal Space

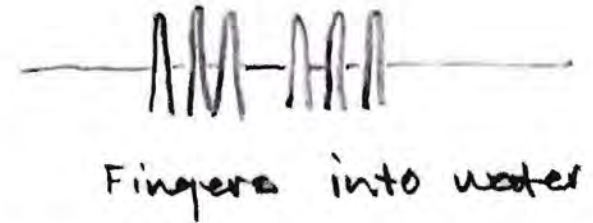


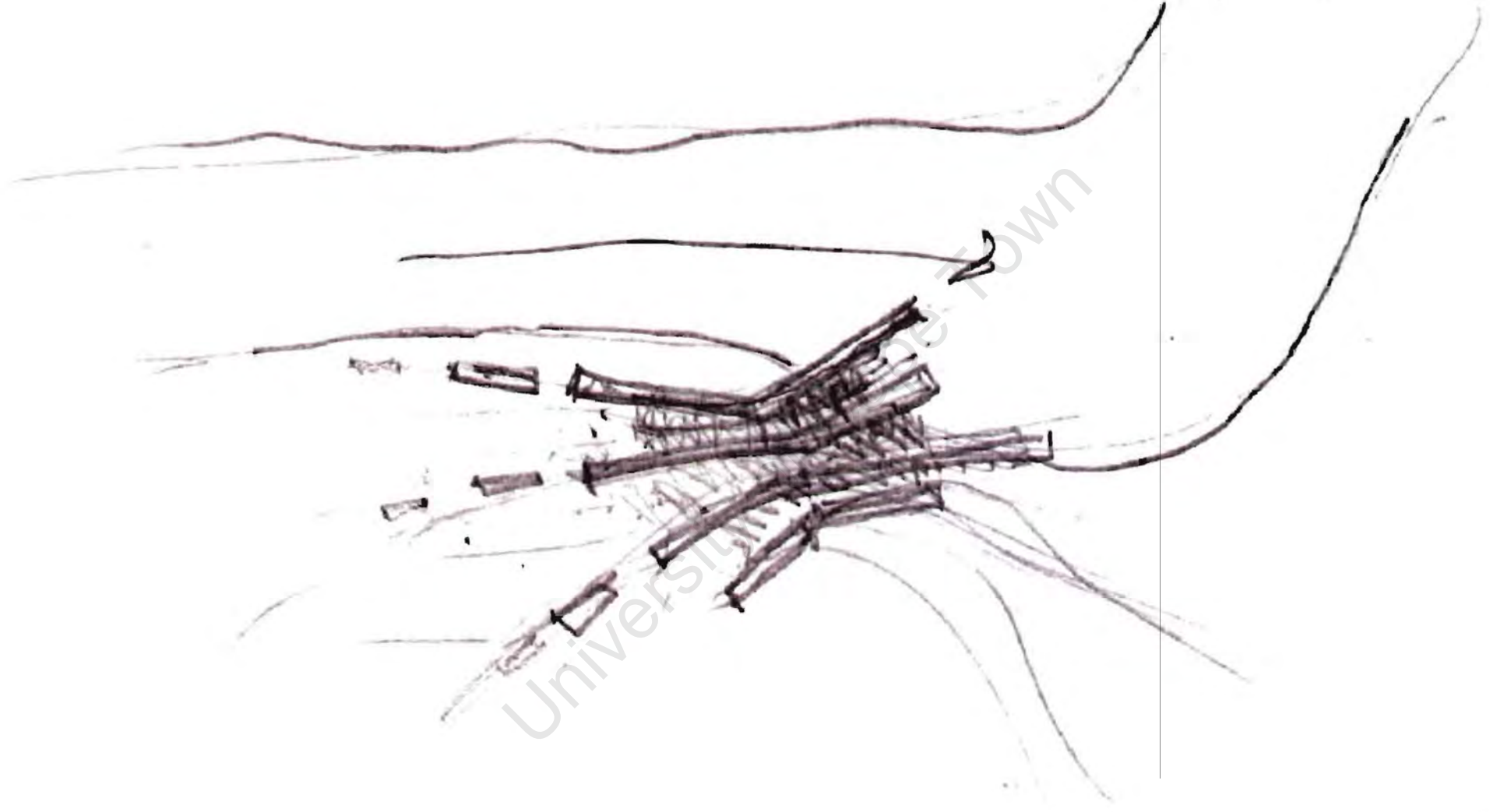


DESIGN DEVELOPMENT

Theoretical and Conceptual Application

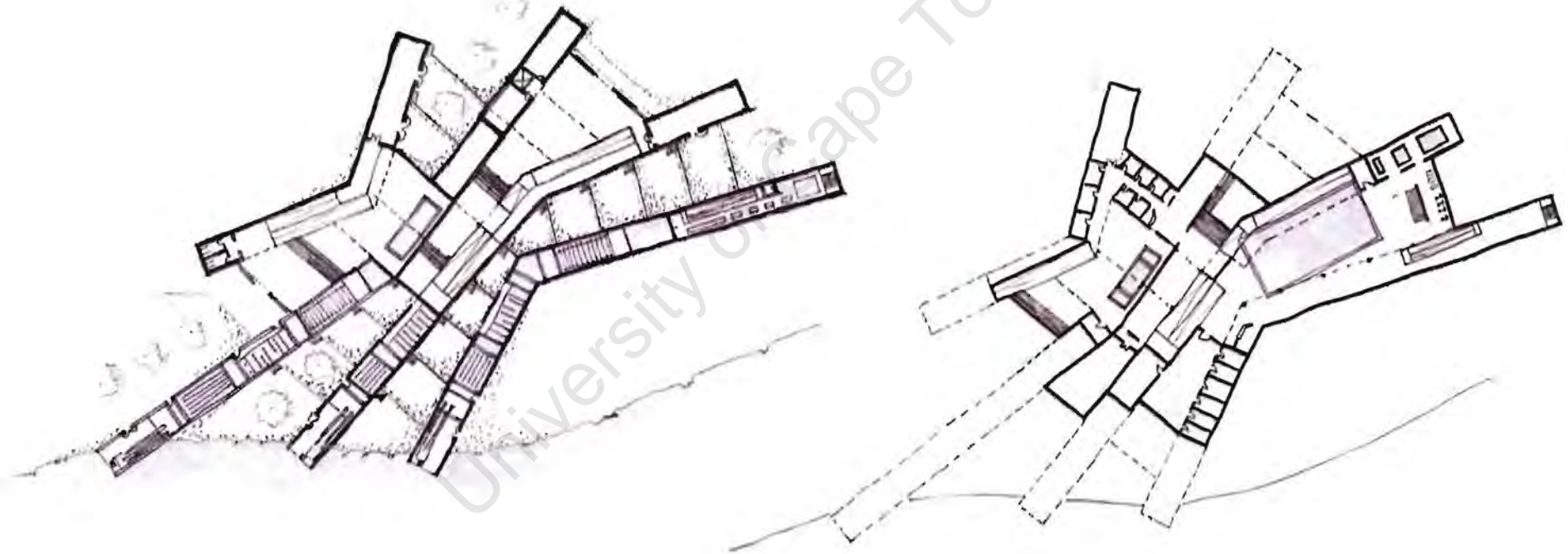
After the previous series of design explorations, the process took a return to the initial concept of healing and a more simple and poetic reworking of the sketch design. What was still not successful in the scheme was the connection of the structure to the river. I wanted to make it look like the building was almost literally 'drinking' from the river. This took me back to one of the very first diagrams I drew, long before there was any formal design scheme. This diagram (to the right) shows 'fingers' into the water depicting someone's hands that are scooping water to drink from a stream or river. In order to achieve this without changing the direction of the building, the river edge was extended to allow a small bay where the building could connect to the water. (SEE DRAWING ON THE NEXT PAGE.)



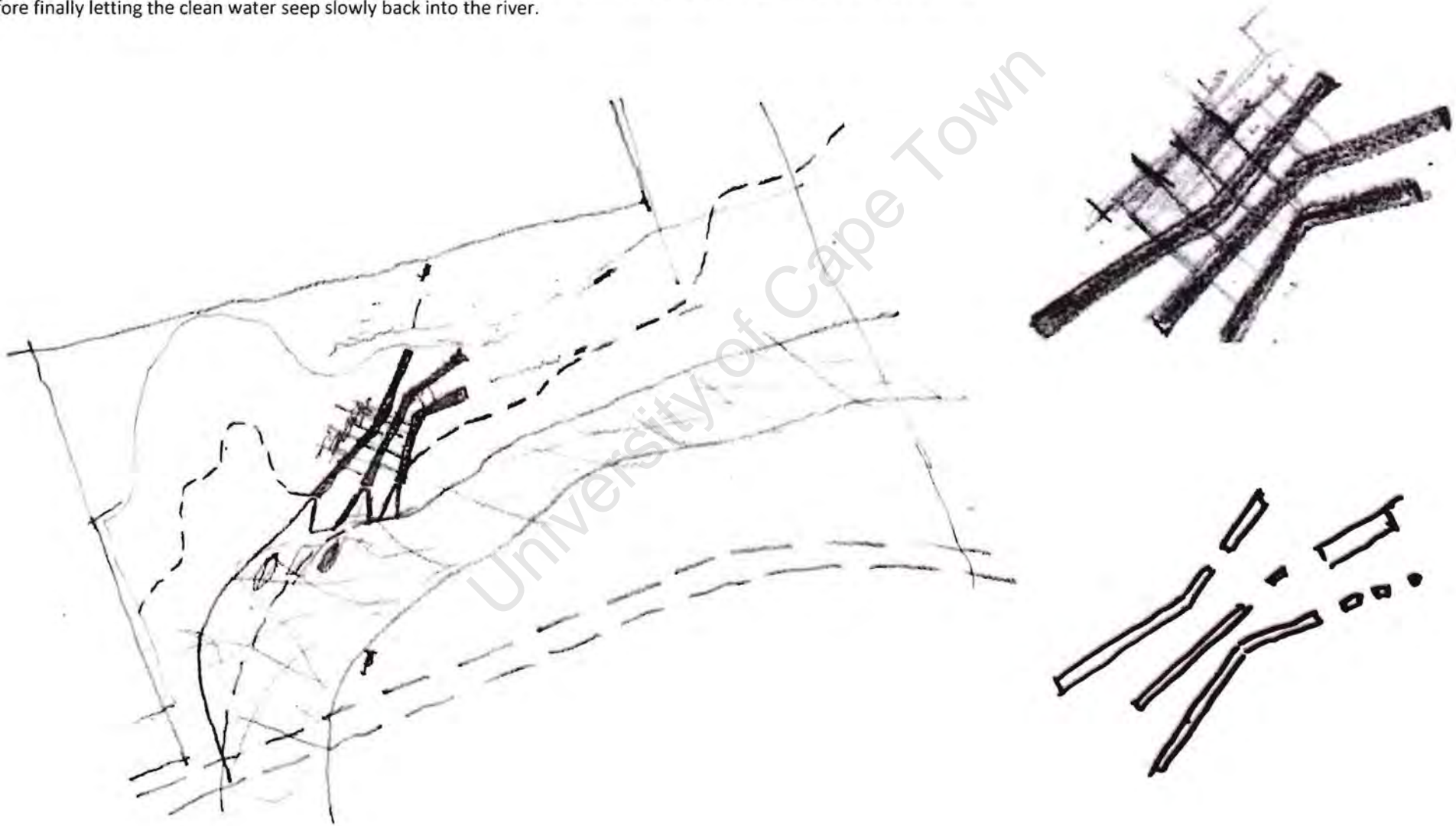


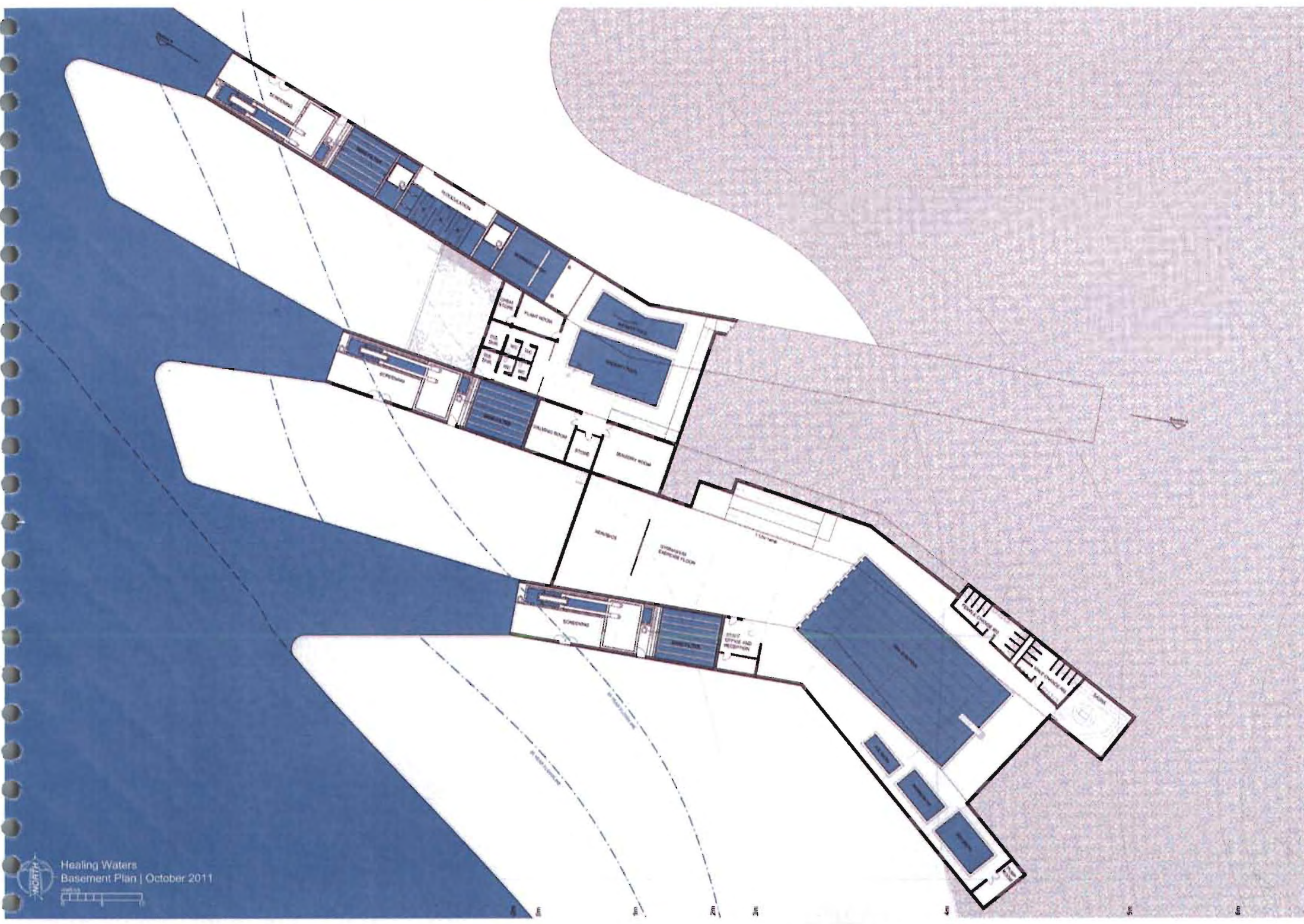


This option allowed the water treatment system to be clearer and to tie in directly with the three main therapy departments of the facility. Now it meant that each 'finger' of water treatment would produce its own water for the occupational therapy, physical therapy and psychiatric therapy departments. If you look at the water treatment process as explained in the *Materiality and Making* section of this paper you will notice that the system ends in a reservoir. This final reservoir would now be shaped into the respective therapeutic pools for that department. However this intervention was in the 50 year floodplain and would have had to deal with extreme waterproofing challenges in order to keep the basements clear of water.

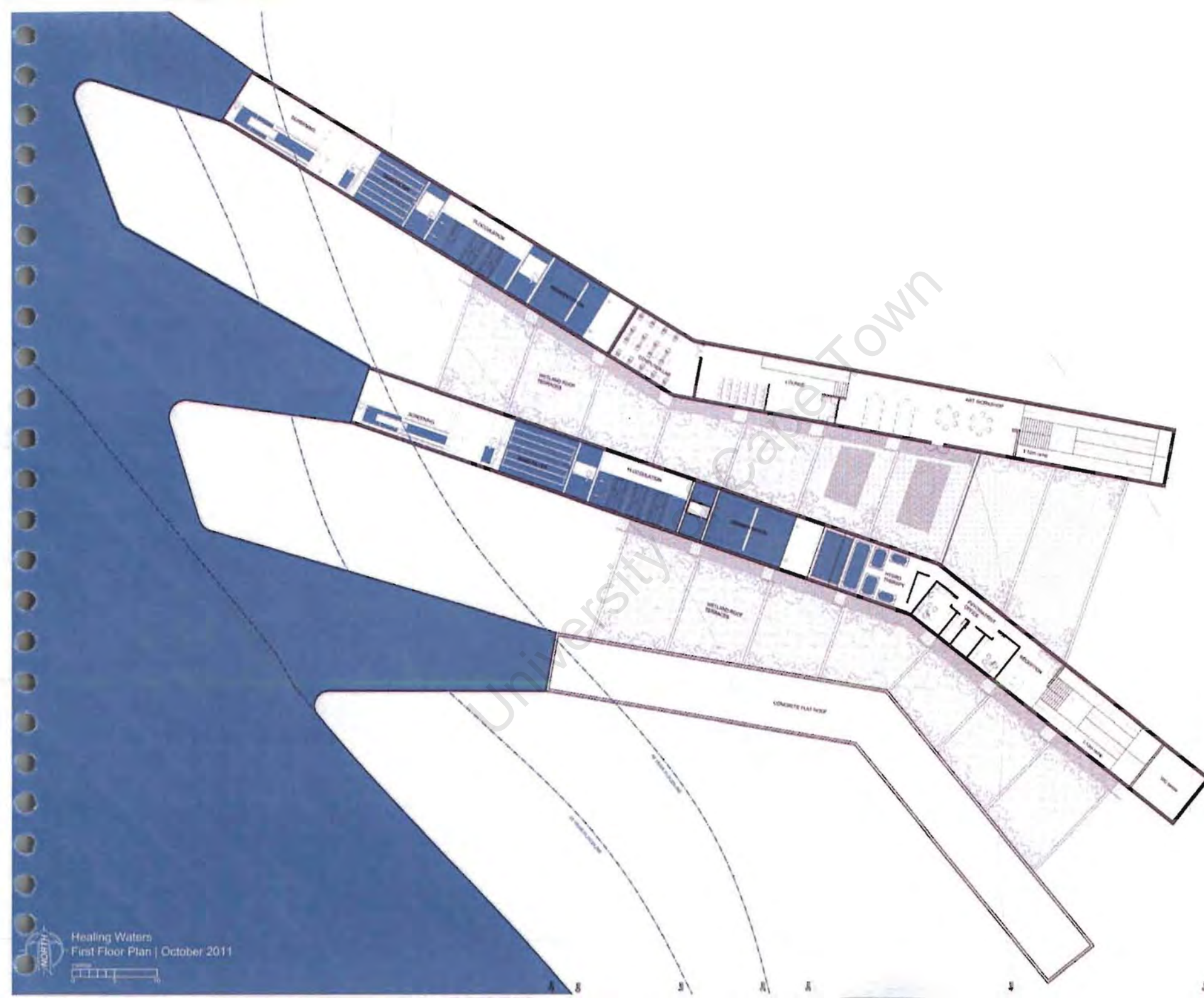


Therefore a further resolution to move the building deeper into the site above the flood line called for the river to be 'cut' in towards the structure resulting in the channels leading to the building as you can see in the sketch. Further simplification also called for eliminating the top short wing of the building. The final result is a simple structure with three wings that take polluted water from the building, purifying it and then using it for therapeutic purposes in the building. Once the water is used, it gets pumped to the roofs of the two spaces between the wings. These are terraced constructed wetland roofs that clean the water through a biological system, taking out any bacteria and pollutants before finally letting the clean water seep slowly back into the river.



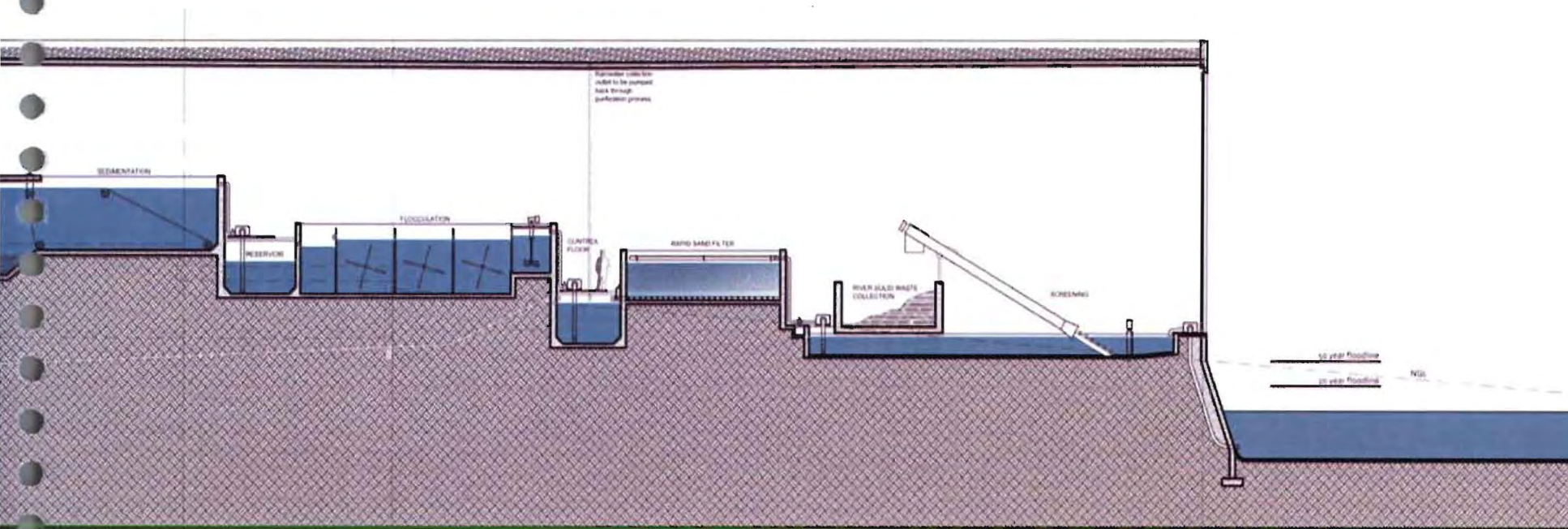








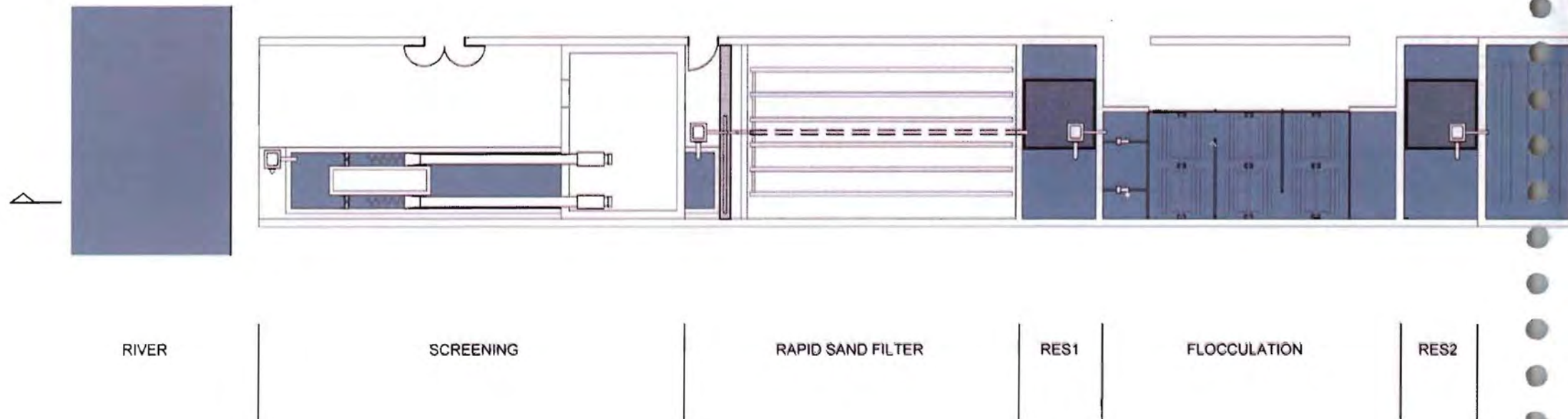
SECTION - A
scale 1:250



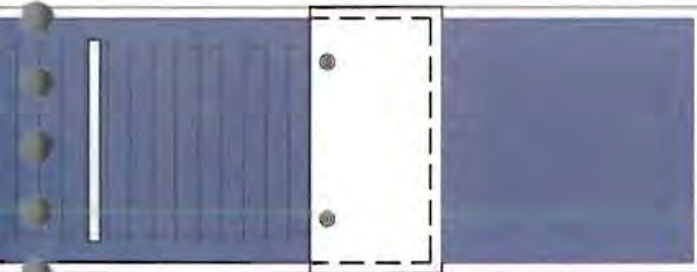
8m

0m

66700



A schematic section through the water purification system as implemented in the design project.



SEDIMENTATION

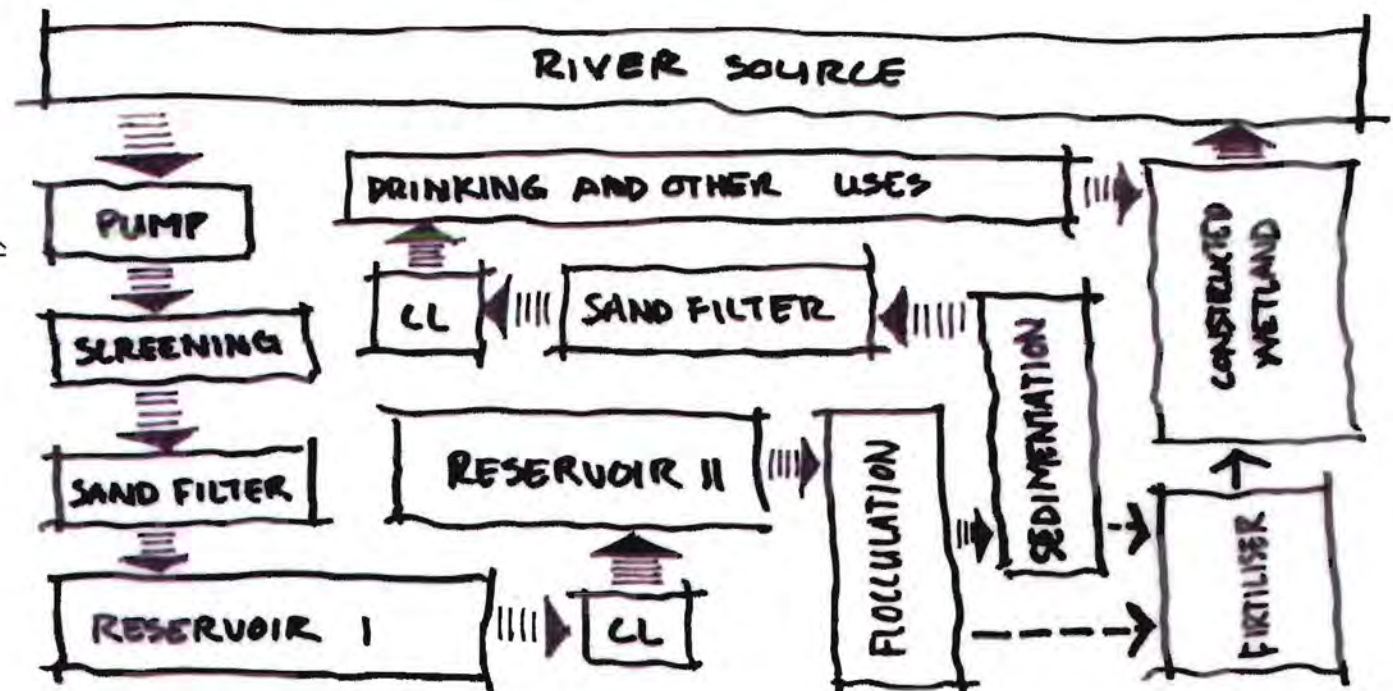
RES3

Materiality and Making

The Water Purification Process

The water purification process normally undergoes five main phases: pre-treatment, flocculation, sedimentation and filtration. In the Advanced Technology Research Report I explained this process in depth. Here follows the explanation taken from that study:

Pre-treatment – this process consists of four steps. Firstly the raw water is pumped from the river source. Secondly, the water undergoes a screening process where large objects such as sticks, leaves and rubble are removed. In this application I have made use of a spirallift for the screening. (SEE DESCRIPTION OF SPIRALIFT FURTHER ON) Thirdly water is trickled slowly through the technique of sand filtering into a reservoir to be stored for a period from a few hours to several days. This allows natural organic purification to take place on a microscopic scale inside the water. In the fourth phase, before the water is taken through other chemical and physical processes, the water quality is analysed to see if pre-chlorination or pre-conditioning is needed. Pre-chlorination is the adding of chlorine to minimise the growth of fetid organisms. Pre-conditioning on the other hand is the adding of sodium carbonate to ensure a pH-balance in the water. (Uvios. 2005)



Flocculation is a process that clarifies the water. This is done by stirring the water with an added agent or coagulant so that foreign particles stick to each other, causing a "floc" (lumpy mass) to form in the water. The excess greasy mass can then be removed by using a method of passing the mixture through a coarse sand filter. Coagulants or flocculating agents that may be used include materials such as iron hydroxide, aluminium hydroxide and, PolyDADMAC (a widely used artificial polymer). (Uvios. 2005)

The water then flows to the near-by **sedimentation** basin which is essentially a large tank where the flow of water is slowed down to allow the floc to settle to the bottom. These basins can be rectangular with water flowing from end to end or circular where the flow is from the centre outward. The outflow from the tank is normally over a weir so that only the thin top layer of the water that is furthest away from the sediment at the bottom can exit. A layer of sludge then forms on the floor of the tank as particles settle to the bottom. The tank may be equipped with mechanical cleaning devices that continually scrape the bottom of the tank and remove the sludge. (Uvios. 2005) The sludge is then added to the organic waste that came from the screening process and is then produced into a fertiliser that can be used for the urban agriculture on the site or can be sold by the community as a form of income.

Filtration - When most of the floc is taken out the water must again go through a sand filter to get rid of any smaller particles that might still be in the mix. Water moves vertically through the top sand layer that removes organic compounds that might give water an unfavourable taste and odour to the bottom finer layers of sand where the more effective filtration happens. (Uvios. 2005)

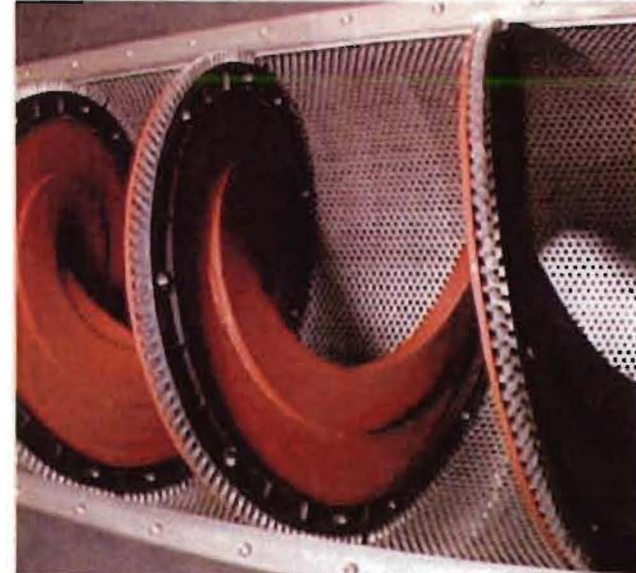
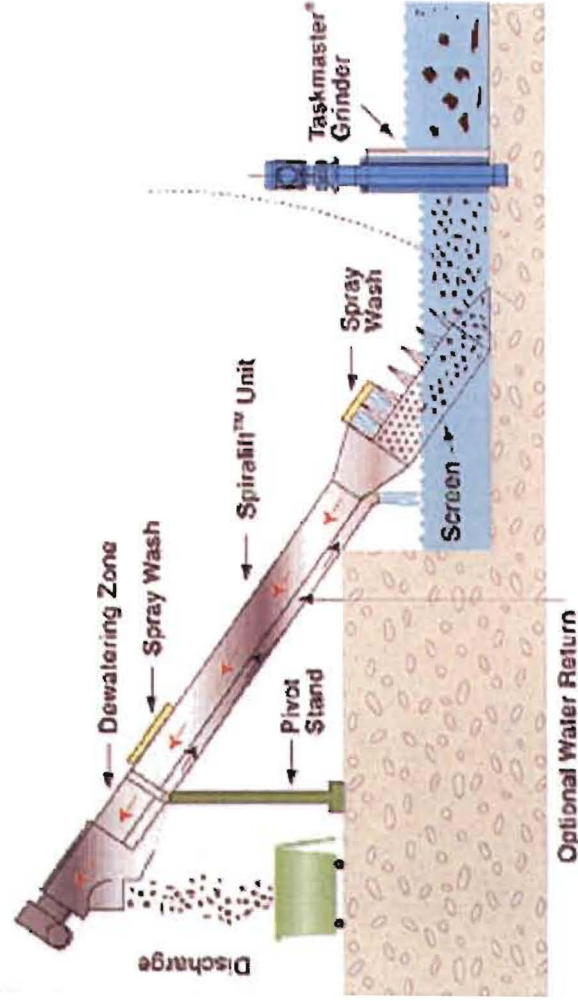
The last process of **disinfection** happens by adding disinfectant chemicals such as chlorine and fluoride to purifying the water prior to drinking. Some pathogens might pass through the previous filters but then get removed by the disinfection process. These pathogens normally include viruses, bacteria and Escherichia coli contained in human excrement. (Uvios. 2005)

After this the water is safe to use in the therapeutic pools. Every few hours the used water in the pools is then pumped back into the system as waste water, and undergoes the same filtration and disinfection process in order to be used again as clean water.

Typical designs and applications of these systems are depicted on the following pages.

SCREENING

Water undergoes a screening process where large objects such as sticks, leaves and rubble are removed. This can be done by means of a SPIRALIFT. It features grinding technology in combination with a shaftless screw screen. The system fine screens, washes and conveys solids out of a channel. The discharge is a homogenous, ground filtrate which is washed, compacted and conditioned.



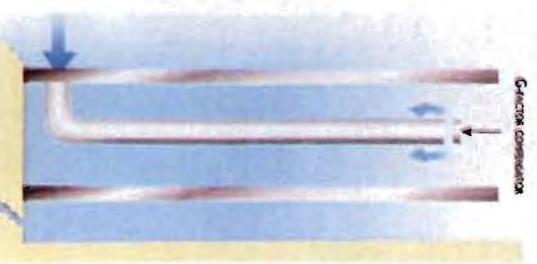
FLOCCULATION

The process of stirring water with an added agent or coagulant so that foreign particles stick together, causing a lumpy mass to form in the surface that is removed later. Coagulants or flocculating agents that may be used include materials such as iron hydroxide, aluminum hydroxide and PolyDADMAC (a widely used artificial polymer).



Horizontal paddle wheel flocculators

MRFs horizontal paddle wheel flocculators consist of stainless steel shafts, structures and paddles. Typically, paddle wheels operate in the mid-G range with low rotating speeds. Since the paddles are large and move a great deal of water, the stages are completely mixed even at low speeds. Made of stainless steel rather than FRP, MRF blades avoid glass-shard contamination and the possible negative affects on downstream membrane filtration. Powered by stainless steel chain that enters directly into the mixing basin, through-wall seals are also avoided. Underwater molecular weight polyethylene lubricated, ultra-high molecular weight polyethylene for long-life and nearly zero maintenance. Greased Cooper sealed ball bearings can be provided.



GRABER CONSTRUCTION

ADVANCED MIXING TECHNIQUES: LOWBACK PRETREATMENT STAGES. MRF OFFERS MIXED BASINS WITH SUSPENDING PATTERNS AND PARALLEL MIXED-SLOW BASINS.

MRF'S SELF-CLEANING INTERNAL FLOCCULATORS USE LITTLE ENERGY AND HAVE NO MOVING PARTS.

STAINLESS STEEL PADDLES: MRF'S all stainless system avoids wear and tear from abrasion.

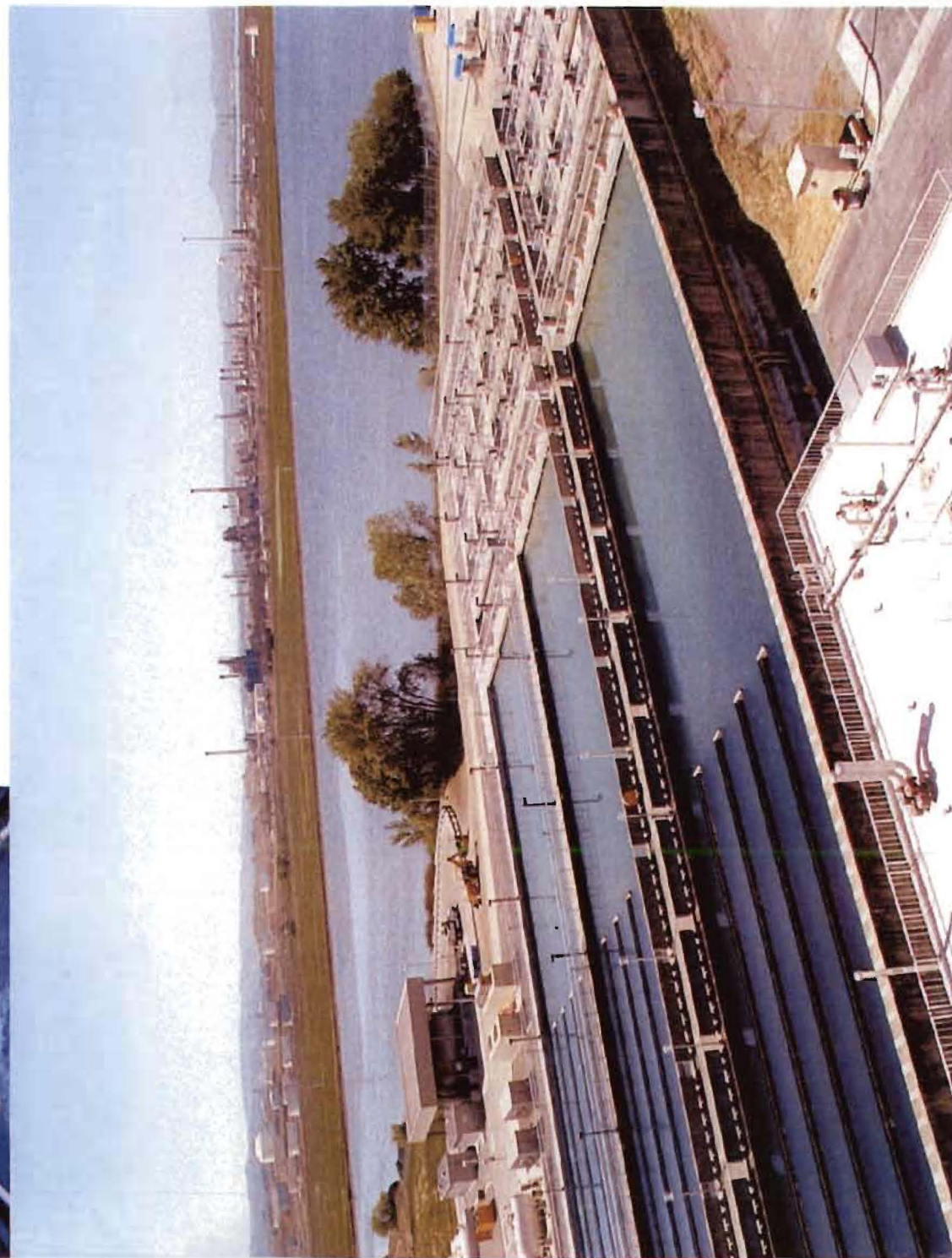
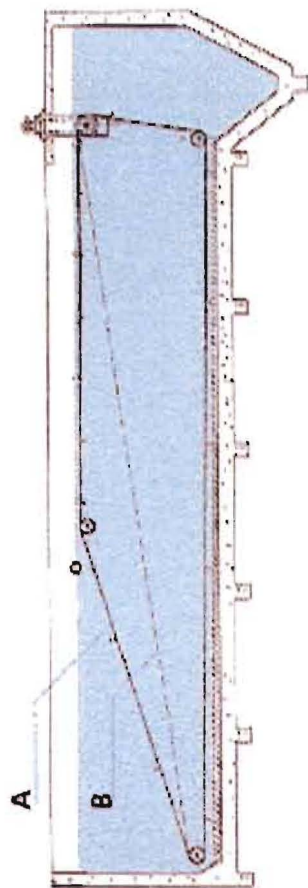
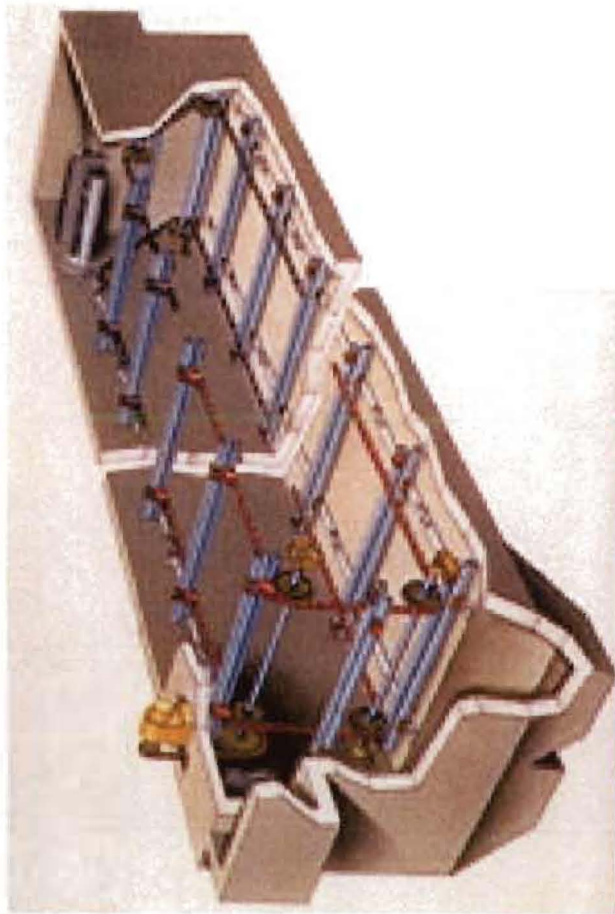
WATER DISPENSER: Quick and easy to install, MRF's delivers clear the energy use of flow entering the sedimentation basin to the gas-which serves better.

DRIVE UNIT: MRF's is powered with nothing and clear to remove power to the underwater drive.



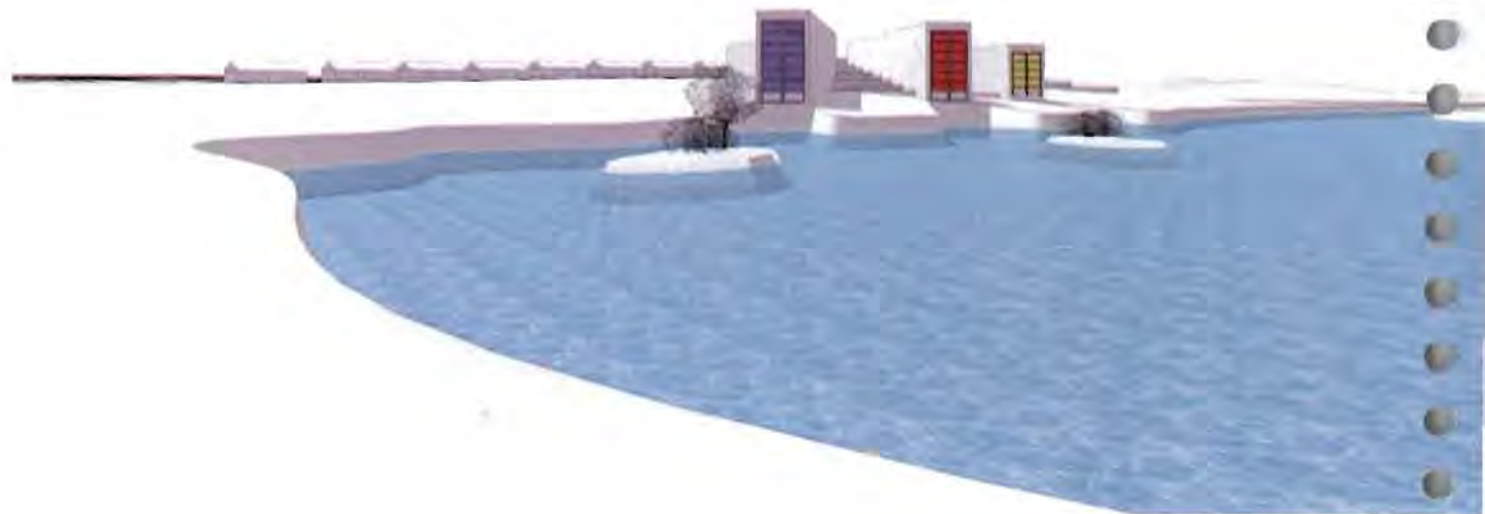
SEDIMENTATION

This process takes the water from flocculation to a large tank where the flow is slowed down to allow the floc to settle to the bottom. A layer of sludge then forms on the floor of the tank as particles settle. The tank may be equipped with mechanical cleaning devices that continually clean the bottom of the tank and removes the sludge that is then taken to the sludge tank and can then be used for fertiliser for agriculture or gardening.



Construction and Materials

The desired aesthetic of the three 'fingers' (the water treatment cores) of the building would be monolithic with open transparent ends that would suggest a strong presence on the site but also a continuation and connection to the surrounding landscape. To achieve this, the structure of the building would be very simple, consisting of a load bearing skin along the three wings. The in-between areas with the wetland terraced roofs would then be supported by these structural cores. In the final design would be included an exploded perspective describing the construction of the wetland terraces and how the water flows through the system. More in-depth resolution to the material application of the rest of the building would also follow in the final design project.



Other Water Applications

One exiting element I want to include in the design and layout of this facility is a hydraulophone. A hydraulophone is basically a musical instrument that works with water – a water organ. It was first developed at the University of Toronto by electrical and computer engineering students Steve Mann, Ryan Janzen and Mark Post. They describe it as a “velocity-sensitive music keyboard in which each key is a water jet.” It produces a very unique eerie but surprisingly beautiful sound very similar to that of a whale.

When I came across this concept, I immediately saw how this could be employed as a form of informal therapy in the programme of the building. Not only can this provide great fun to a person playing the instrument but it can also encourage a patient to make-up his own music as he controls what jets (notes) to press and when. Throughout my research in the rehabilitation of mentally and socially disabled persons, it has been emphasized several times how important it is to give the patient/client a sense of control of his own environment. This can be done in a fun and exciting way with the hydraulophone.

Photos of a hydraulophone (water organ) [21][22]



CONCLUSION

It is no doubt that if a project like this is ever realised on this particular site that it would only serve to enhance the rich history of the area as a place of healing within the city. It is clear that the architecture itself could assist in a new form of healing and can contribute to a new understanding of healing, rejuvenation and wellbeing suited to the 21st century. What's more is that it could serve to set the course for a future enriched and interdisciplinary field of study and implementation between that of architecture, human psychology and the environment.

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